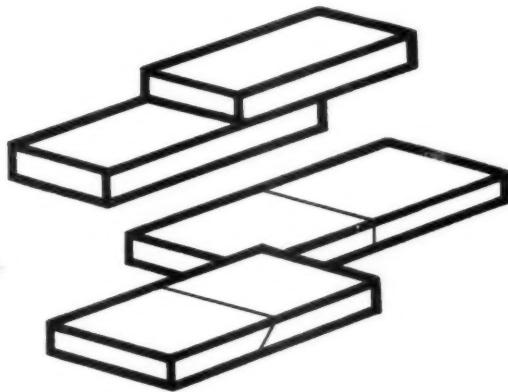


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assembly & fastener ENGINEERING

MAY • 1961 • 50 CENTS



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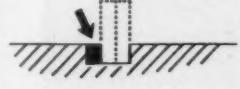
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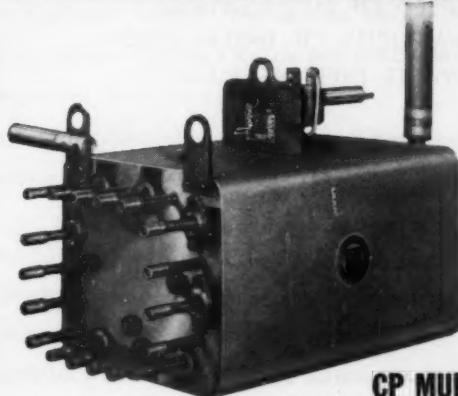
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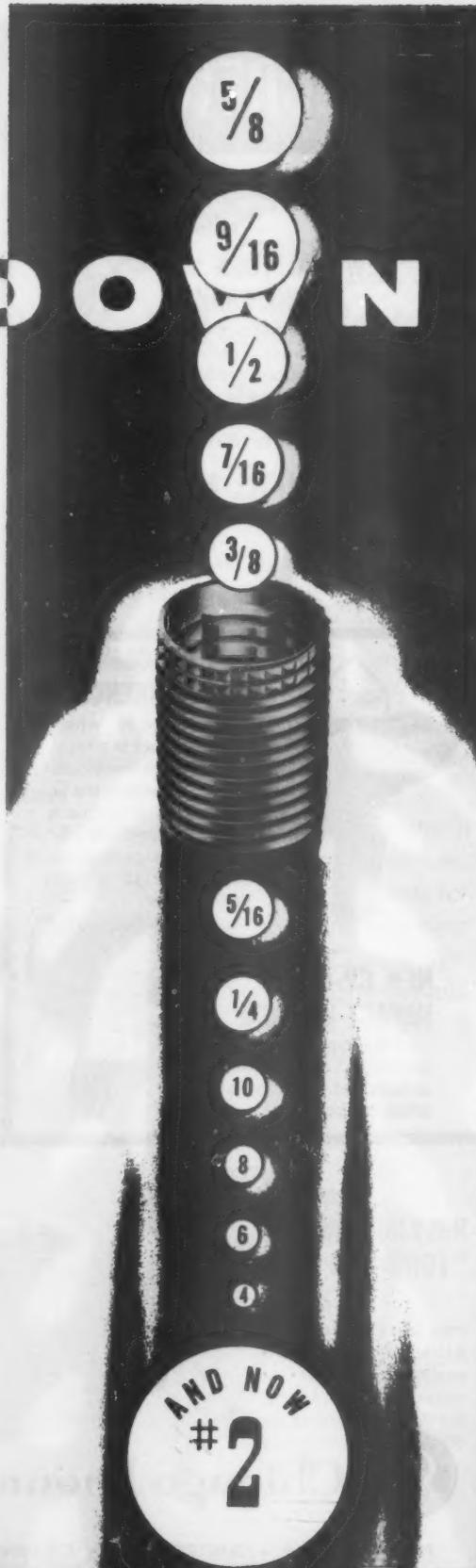
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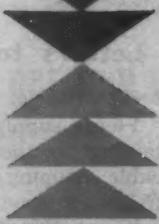
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ENGINEERING

BETTER DESIGN AND ENGINEERING FOR ASSEMBLY

Volume 4, Number 5

May, 1961

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BPA

COMING NEXT MONTH

- Loop Conveyor Expedites Assembly of Instrument Panels at Pontiac
- How Fastener Tension Varies with External Joint Loads—conclusion

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Letters to the Editor

Braid Stripping

Please supply information pertaining to the brief article on cable stripping on page 18 of your February issue.

Dale A. Gittings
Industrial Engineer
Warwick Manufacturing Co.
Zion, Illinois

Regarding the braid stripping machine for shielded wire, please advise the address of Cadre Industries.

H. A. Harris
Industrial Engineer
Joy Manufacturing Co.
St. Louis, Missouri

• Additional information is available from Cadre Industries Corporation, Box 150, Endicott, New York.

Glass-to-Metal Sealing

On page 22 of your March issue is a short article on "Ceramics Improve Glass-to-Metal Sealing." I would like to have the address of Duramic Products.

Arthur Short
Glass Engineer
Raytheon Manufacturing Co.
Waltham, Massachusetts

I would like to receive additional information on this process from Duramic Products.

Rene O. Moser, Engineer
General Electric Company
Auburn, New York

• More detailed information is available from Duramic Products, Inc., 423 Commercial Ave., Palisades Park, N.J.

Math Over Lightly

Regarding the "math over lightly" problem in Rudy's March column, the answer of \$1.85 is in error. It should be \$1.89.

William Zelenka
Standards Engineer
Lockheed Aircraft Corp.
Burbank, California

The \$1.85 price in "math over lightly" is wrong because \$1.25 plus 8² equals \$1.89.

Edward E. Leird
Design Group Supervisor
Micro-Switch Division
Freeport, Illinois

• Thanks for bringing this typographical error to our attention.

Misplaced Address

A quick reading of our copy caused you to put the Schwinn Company in Brooklyn (February, page 26), when actually they are located in Chicago. It is the Induction Heating Corporation that is located in Brooklyn.

John Farley
Christopher Cross Assoc.
New York, New York

• Our apologies to both your client, the Induction Heating Corporation, and to the Schwinn Company.

more work per tool per man hour!

CLECO

number

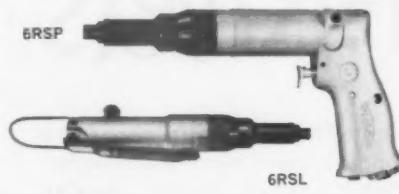
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drills, nutrunners and
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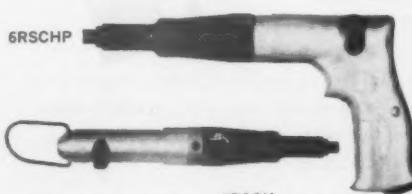
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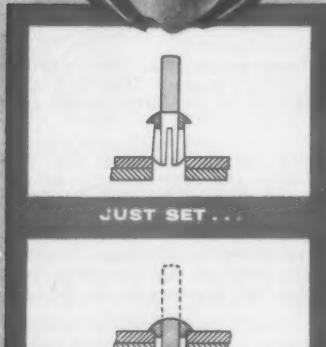
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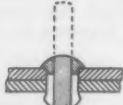
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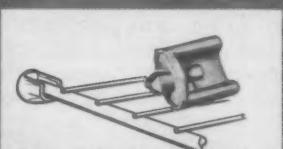
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informative brochure listing 25 standard
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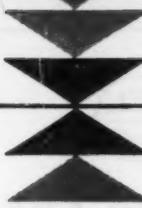
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THE EDITOR'S VIEW

MAY, 1961, VOL. 4, NO. 5

THE DOUBLE-STANDARD IS STIFLING OUR IDEALISM



One of the crucial problems facing this country is convincing the peoples of the world that ours is the way of life that should be emulated—and not that of the Communists.

But what is the American way of life we are trying to hold up as an example to the world? Certainly, not the double-standard which seems to be pervading every phase of our life. One needs to study only a few examples of this to realize that we have a yoke which is getting tighter and tighter—a yoke which is threatening to snuff out the idealism for which our way of life has been noted.

Consider the example of the industrialist who has the dubious distinction of being labeled a "corporation looter," liquidating one company after another, without concern for the thousands of workers who lose their jobs by his financial maneuvers. Yet, not long ago he was cited by a newspaper columnist as being a "civic minded business leader"!

Look at our judicial system which permits a judge to throw the book at a person convicted of perjury—except where it pertains to traffic cases. Here, the innocent motorist is urged to plead guilty just for expediency. Or consider the leniency of courts in embezzlement cases involving many thousands of dollars. Yet, ponder the case of the vagrant who was sent to prison for

life as a habitual criminal; his last offense, stealing 24¢.

What about our television networks which self-righteously state that they adhere to the industry's code of ethics. But what type of code is one that permits a "family hour" program to show a man suffering the tortures of the noose.

What about our great educational system which thrives financially on ever-expanding athletic programs—but which reprimands those colleges which lack the finesse to keep their recruitment policies hidden under the board.

What about those business leaders who profess great concern for their fellow man, and are most vociferous about their religious convictions, yet whose business tactics indicate otherwise.

What about labor unions which wage economic war in an effort to impose their will upon industry, yet refuse to let their own clerical help be organized.

What about management which condemns featherbedding at the worker level, but condones and abets this same practice at the management level.

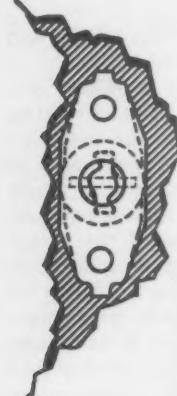
The double-standard can be seen at almost any level in our business world. It is sapping our moral strength and stifling our idealism. We must throw off this yoke if we are to become truly worthy of the image we are trying to present to the world.

Editor



For quick access and closure . . .

LION **1/4 TURN OPEN 1/4 TURN CLOSED** FASTENERS



NO. 5 STUD



RETAINER



RECEPTACLE



Hinged and completely removable panels are secured reliably by unique Lion Fasteners which are opened or closed by a quick $\frac{1}{4}$ turn. These mil spec (MIL-F 5591A-ASG) fasteners have a high strength to weight ratio, lock smoothly with a positive grip, withstand vibration.

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Both stud and receptacle "float" to accommodate misalignment. The hole, which retains the stud, is twice as large as the stud cross-section. This permits a float of .070 in all directions. The leaf spring receptacle also floats to accommodate stud positions.

WIDE VARIATIONS IN STACK HEIGHT

Total sheet thickness may vary as much as +.035 or -.015 without affecting operation. A Lion stud, specified for .160 total thickness, for example, will accommodate any stack height between .195 and .145.

SWAGED-NOSE STUD

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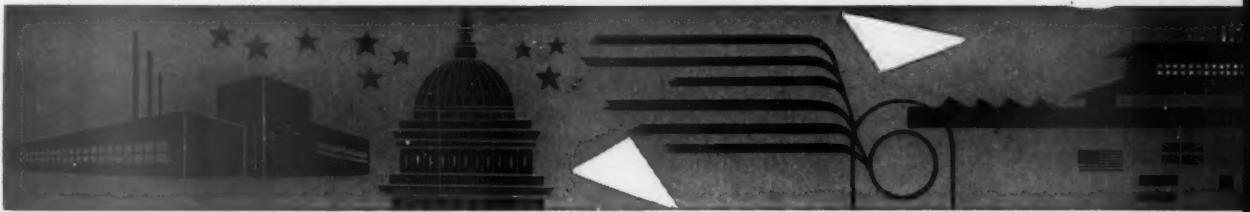
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The State of Business



THE INDIVIDUAL IN THE ORGANIZATION

by **Crawford H. Greenewalt,**
President
E. I. duPont deNemours & Co.

Judging from the sheer volume of bibliographic material, it is clear that one question near the top of every worry list is that which surrounds the place of the individual in a world committed irrevocably to organizational procedures.

Everyone, it appears, recognizes the fact that the individual's role in modern society has undergone a change. I suppose there may have been a time when men were completely independent agents, accountable to no one but themselves. If such a circumstance ever did exist, it has long since vanished into the limbo of prehistory. In the earliest records of civilization we find the roots of a tribal structure and the congregation of human beings into groups for purposes of defense, of co-operative effort, or perhaps because of simple gregariousness. As an economic entity, it is reasonable to suppose that man, the hunter, could once have existed alone. As a social animal, he has for many centuries been dependent upon his fellows.

Sir Francis Bacon was reputed to have known, personally, all there was to know of science as it was in his day. In contrast, we now have a body of scientific knowledge so vast, that it is impossible for any individual, no matter how learned, to comprehend more than that small fraction contained within the narrow boundaries of a single discipline.

Society has become so intricate in its structure that specialization is borne in upon us both as individuals and as members of a vocation. We grow increasingly dependent and interrelated if only because we no longer have the time, or the inclination for that matter, to master the simple skills that once made man his own cobbler, his own tailor, and his own barber. The teaching of the young, which once took place at mother's knee, is now a profession, just as her spinning of yarn is now an industry and her bread-making an involved system of baking, packaging and distribution. Society itself has become an organization. Under this premise, some of us teach, some of us manufacture, some of us govern and some of us meditate upon the state of our virtue and the sanctity of our souls.

It is to organizations that we look today as the responsible instruments of human achievement. The national conviction seems to be that nothing can be accomplished without organization of some sort.

Greenewalt has been with duPont since 1922, and has been president since 1948. He is a member of many organizations, which include the National Academy of Sciences. He is the author of two books, one of which is "The Uncommon Man", published in 1959. The book stresses the importance of individual initiative in the organization.



In scale, as well as in scope, our organizations have grown mightily. The government has become an enormous complex which actually employs a larger share of our population than does agriculture. Our national labor groups count their members and their treasure in the millions.

The problem of our present society is how best to preserve the creative power of the individual in the face of organizational necessity. The problem exists regardless of the purpose toward which the organization is directed.

All are concerned with safeguarding equities, with delineating a common purpose, with the maintenance of standards and the preservation of an environment conducive to the best effort of their members.

Being humanistic institutions composed of human beings, the problems each must face are in the broad sense common to all.

Fantasy and misconception obscure the truth and are certainly a disservice to scientific inquiry. The assumption that the problem lies only with business, gives to other equally valuable organizations a sense of false security. There is inherent danger in man's involvement with large numbers of his kind. Men, as well as children, can lose their way in crowds.

The problem, moreover, is not solely one of protection for the in-

continued

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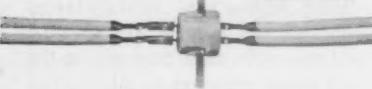
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Business, continued

individual. It is in some respects one which involves protecting the organization itself, from the stagnation created by those who find that "conformity," like vice, can first be endured, and finally embraced. The unhappy fact is that conformity is for some an alluring state. All too many, I am afraid, reach a point at which they seek refuge in protective coloring, with security replacing accomplishment as the primary goal.

When this happens, instead of the individual becoming the victim of pressures within the organization, it is the organization that falls prey to "organization men." A comfortable sense of ease may bring solace to an individual, but to the organization itself, it brings only a descent to mediocrity.

We might cite Robinson Crusoe, untroubled by any obligations not of his own making. For the opposing extreme, I might suggest an example drawn from natural history, found in Darwin's comments on the army ant: "Natural selection has been applied not to the individual, but to the colony, within which there are no individuals at all but simply cells in an insensate organism, powered by blind instinct."

It is no solution to suggest that we turn back the clock to the day of small artisan enterprises, worthy and satisfying as those simple times may have been. Nor is it any solution to withdraw, like the beatnik, with a weary protest manifested in a beard and soiled sneakers, and a vernacular which identifies his house as a pad and his wife as a chick.

Progress produces problems, but if we face them squarely and refuse to be misled by superficialities, they can be met. Part of the present difficulty arises out of our attempts to rationalize human behavior in terms of a statistical norm and to replace intuitive judgment with a formula.

A human being is not an inert compound whose boiling point and specific gravity can be determined precisely. Even the terms and definitions with which we examine the problem are elastic and inexact.

We like to use the word "freedom," for example, in describing the goals of our society, being at the same time uncomfortably aware that

complete freedom is something which rarely exists.

To the extent that we join together in any form of association, we surrender some part of our independence as the price of harmonious human relationship.

Actually, we see this in the benevolent institution of matrimony. It is in marriage that man makes the first voluntary surrender of rights and privileges which until then, had been purely his own decision.

It is similarly so in any social or business relationship. We are obliged, not by compulsion, but by the amenities to waive certain of our rights and some of the more individualistic traits of our personalities out of deference to the general good.

As we accept those restraints, we approach the condition which is so widely discussed today as "conformity," a loose and flabby term often misused and misconstrued. It is evident that there is confusion between the voluntary conformity and behavior, which we call good manners, and the enforced conformity of thought which represents an invasion of personal rights and a brake upon our capacity to follow our own destinies.

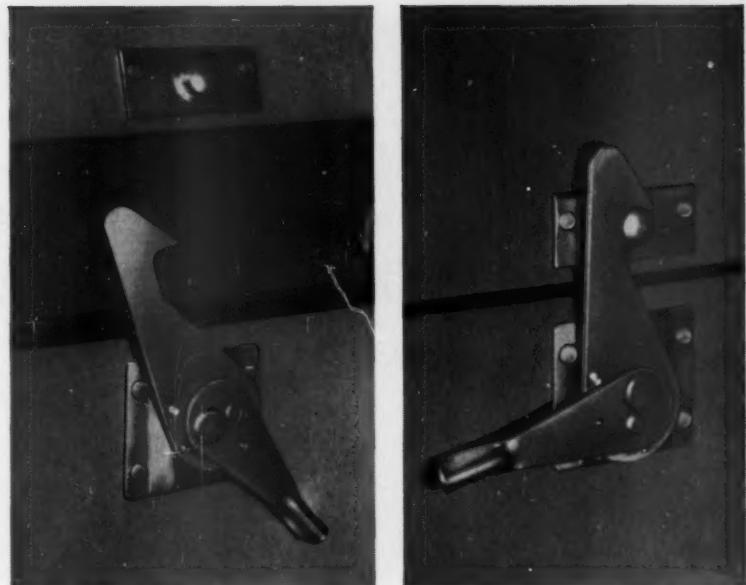
In the social area, we bow to accepted standards without loss of self esteem. In the realm of thought and of ideas, however, we rightfully resist any effort to submerge our personal characteristic into a dull and lifeless composite.

An organization does not flourish by virtue of the superior talents it enlists. All organizations fish in the same general pool, and it is unlikely that any nets a catch appreciably better than others. Its advancement will derive from having provided for its people a climate of achievement in which men of ordinary stature are somehow stimulated to extraordinary performance.

Achievement, after all, begins with the human intellect. Organizations, perhaps unfortunately, are without this God-given capacity. They exist and prosper only as they can give free rein to the minds and spirits of their people. When they cease to do so, they cease to be organizations and become, first empty shells, then anachronisms, and finally memories. Only man's intellect and spirit, after all, are vital, sanctified and immortal.

WHAT HOOK-LOCK IS

HOOK-LOCK is a springless, positive-locking latching device which is ideally suited for use on rigidly specified military transit cases as well as less expensive commercial containers. It provides high closing pressure and tremendous load-carrying capacity...is impact and shock-proof. HOOK-LOCK is so designed that it lies flat against the mounting surface whether in open or closed position. Since operation is parallel to mounting surface, no space for operating clearance is required.

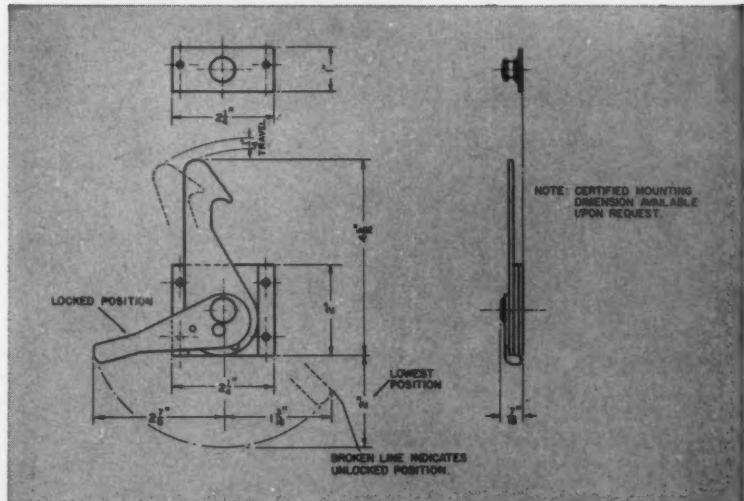


HOOK-LOCK lies flat against mounting surface, open or closed.

New—HOOK-LOCK container latch...It's flat!

FEATURES

- Shock-proof—solid construction...withstands high impact blows directly on the fastener.
- Closing pressure of 200 lb. Where needed, pull-down pressure can be substantially increased by modification of operating lever.
- Tensile load capacity: 750 lb.
- Compact—lies flat open or closed. Extends just 7/16" from container surface at thickest point.
- Positive-locking and springless. Unaffected by arctic temperatures.
- No operating clearance required, because hook and lever move parallel to mounting surface.



IF YOU have questions regarding the possible application of HOOK-LOCK or other Simmons industrial fasteners to your particular needs, your inquiry will receive our immediate attention. Contact your nearest Simmons office or write direct.

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NEWS

Vol. 4, Issue No. 1

Bartlett, Illinois (Chicago Suburb)

We Specialize In
Solving Puzzling
Screw Problems

Progress Edition

Extra Tough, Extra Clean, Extra Scale-Free because only SETKO Screws are Isothermal Heat Treated

THIS HEAT TREATING PROCESS
IMPARTS A DISTINCTIVE
BLUE-BLACK COLOR WHILE
PROVIDING DISTINCTIVE
PERFORMANCE
CHARACTERISTICS . . . YET, IT
COSTS YOU NOTHING EXTRA.

Extensive use has proven that socket screw products treated by this process are tougher and cleaner. Threads, heads, points, shanks, etc. are scale-free. This means better fit, better performance. Also, Isothermal heat treated socket screw products prevent decarburization...and it costs you nothing extra. It's another Setko exclusive in the socket screw field.



Standard on most Setko socket screw products

Isothermal heat treating has been adopted by Setko as a standard on most standard and special socket screw products including; hex socket, fluted socket, and slabbed head set screws as well as hex socket cap screws. (Stainless steel screws are generally not heat treated.) Unless you specify otherwise, screws that you order in these primary categories, regardless of points, or locking actions, will be isothermal heat treated. It costs you nothing more for this bonus value extra.

Take the Setko "Look Test"

Compare the unplated finish of Setko socket

screws with other products using other methods. You'll see the cleaner, scale-free threads, heads and points that have made Setko socket screw products outstanding in their field. Write for test samples. Send us your specifications and requirements for advantageous quotations.

Isothermal heat treating minimizes distortion

You get low cost, more dependable performance on the production line and in the field — Isothermal heat treated screws have a minimum of distortion. Far less than commonly used methods. Screws fit better, hold tighter. It's the same heat treating method used by manufacturers of precision products such as: razor blades, etc.

B-187

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Setko engineers will
reanalyze your socket screw
product requirements

As a part of the continuing Setko program of product re-evaluation, Setko engineers will work with you in determining the best combinations of devices for your specific requirements. All you have to do is send a sample of the assembly with your specifications and they will make recommendations and suggestions, promptly and without delay. Take advantage of this offer today, you may realize substantial savings in increased reliability, lower production costs, or faster, easier assembly methods. Address requests on your company letterhead.



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Ideas and Field Reports



WELDING WITH AID OF MICROSCOPE SIMPLIFIES ASSEMBLY



Parts for rectilinear potentiometer are welded under microscope by R. L. Smith, an engineer in the new Mektron Division of California General, Inc.

Development of a new and advanced rectilinear potentiometer was made possible by simplifying the assembly process and a new design.

It is made by the Mektron Division of California General, Inc., Chula Vista, Calif.

A part of the simplified assembly process is the resistance welding of all connections, with the aid of a microscope. By welding the parts, instead of using the conventional soft soldering method, the potentiometer is kept free from solder contamination materials.

The new design also permitted the elimination of time consuming fastening of some of the parts with screws. The new unit uses only one screw. Units of similar design use four or more screws in their assemblies.

PLASTIC PADDLE SMOOTHES SOLDERED SEAMS

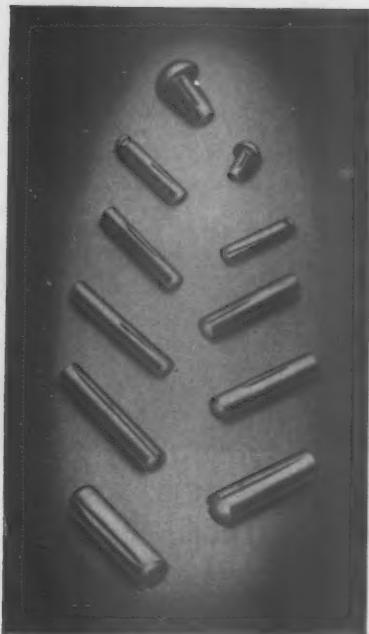
To obtain a smoother finish for solder applied to welded automobile body seams, the Lincoln-Mercury Division of Ford Motor Co., has developed a unique tool which utilizes a nonmetallic phenolic laminate material.

As he melts the solder, a workman welds a small rectangular-shaped laminate paddle mounted on a steel handle. All spill-over of the molten solder is immediately smoothed and removed before it has a chance to solidify. As a result, there is little or no excess material to remove before painting.

The laminate paddle is made
continued



Operators use laminate paddle to smooth molten solder over welded seams of automobile body.

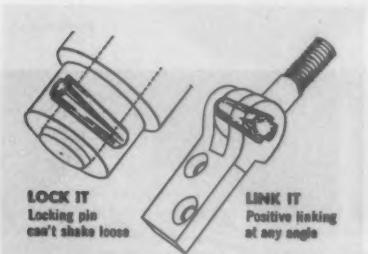


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THE SOLID GROOV-PIN

Every one of the Groov-Pins shown here was designed with your pin problems in mind. Designed to withstand the rigors of constant shock and vibration without loosening...to drive easily into a simple drilled hole...for faster hand or production feeding, including hopper feed...for a permanent connection that stands up to vibration fatigue as only a solid pin can.

Groov-Pins are made to meet your requirements, too. Standard sizes run from $\frac{1}{16}$ to $\frac{1}{2}$ ", specials to fit your needs at standard prices over 5,000 pieces. Send for illustrated catalog, free samples.



No matter what your pin problem,
there's a Groov-Pin to solve it for you.

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Ideas and Field Reports, continued

of Grade 20201-2 Westinghouse Micarta with a glass silicone base. It is non-adhesive and minute particles of hardened solder do not adhere to the surface of the paddle. Because it is a nonconductor, the

plastic laminate does not conduct the 550° F soldering heat into the handle.

Replacing wooden paddles which lasted only a day, the new paddles last an average of 20 days.

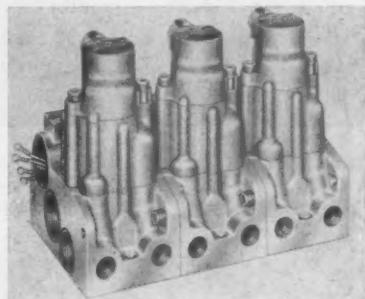
DESIGN MANIFOLD VALVE BASE FOR EASY MOUNTING

A modular manifold base, made of cast aluminum, is designed for multiple manifold mounting of $\frac{1}{2}$ " PDQ control valves.

Meeting JIC standards, and featuring a common supply, exhaust and wiring conduit ports, the bases can be ganged end-to-end to manifold two or more valves in a single or compact assembly.

The electrical connections, valve to base, of the manifold are the plug-in type to reduce downtime to a minimum.

Another feature of the Hunt Valve Co. manifold base is the bayonet-lock construction of the PDQ valve, which permits removal and



Modular manifold base permits manifolding of two or more $\frac{1}{2}$ " valves.

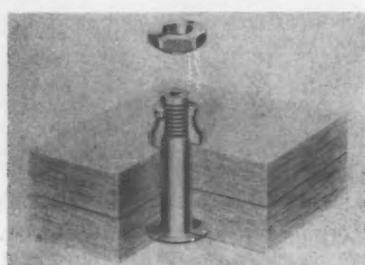
installation of valve and pilot assembly in 30 seconds, without disturbing piping or wiring.

EXTEND THREADED FASTENER USE IN SUB CONSTRUCTION

A fastener's ability to overcome two troublesome problems, installation in very restricted structural areas and the crazing or cracking of plastic structural materials resulting from assembly by impact driving techniques, has resulted in the use of the fastener in current submarine construction and repair work.

The new fastener is the BUS version of the Hi-Lock fastener currently used in the aero-space industry. It is made by Hi-Shear Company, Torrance, Calif.

The fastener can be rapidly and quietly installed in a variety of tight clearance areas, as well as open areas, because of the 90° tooling approach to the fastener during assembly. They can be installed with



Fastener has special pre-established torque level, protecting soft materials from damage.

especially adapted power tools, or with hand tools.

The fastener is specifically designed to a pre-established torque level safely below the critical bearing value of the plastic materials encountered.

PLIER LINING BONDED TO METAL WITH ADHESIVE

Pliers, intended for use by professional opticians, are being assembled with the aid of Eastman 910 quick-setting adhesive.

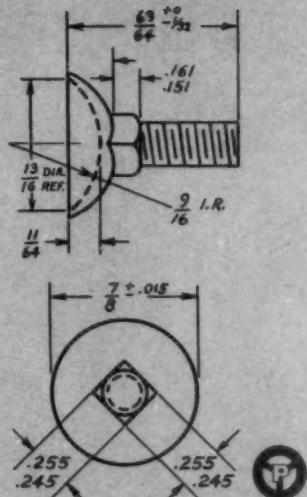
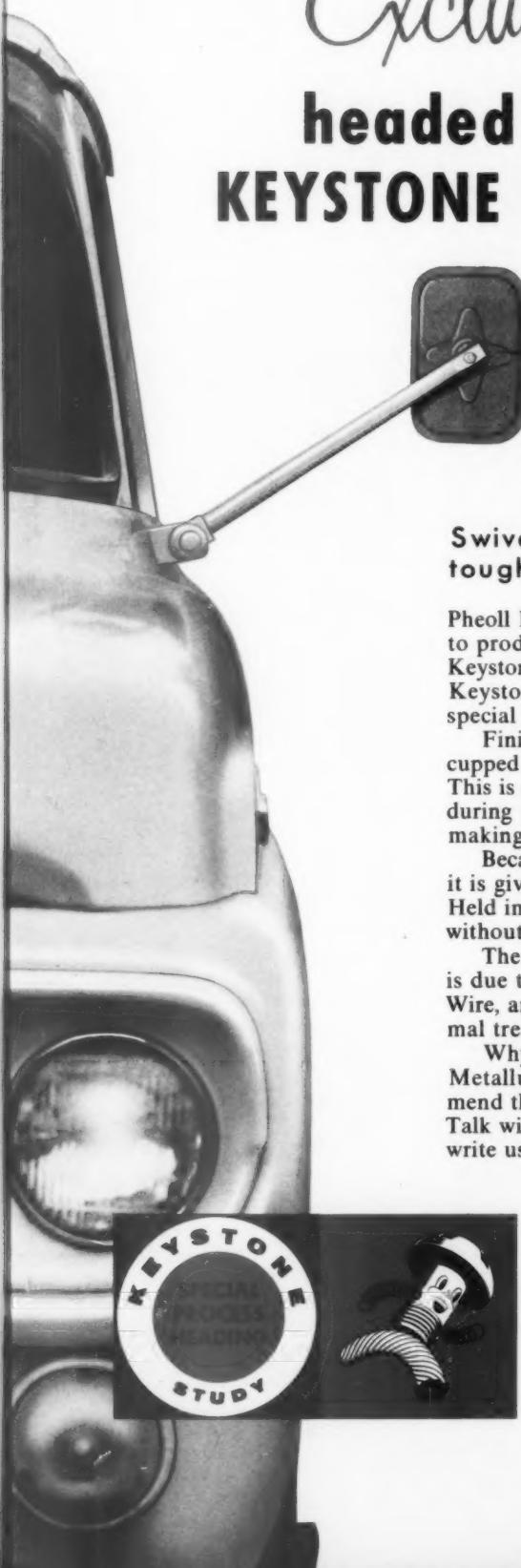
Dr. Edwin T. Jenison of San Antonio, Tex., designer and manufacturer of the pliers, found that a production bottleneck existed in

bonding the facing materials to the plier jaws because of the heat, catalysts, or long setting time required with adhesives formerly available.

Virtually all types of textiles and rubber are bonded to the plier jaws using one drop of the adhesive for each bond. The bonding action is al-

continued

Exclusively
**headed from
 KEYSTONE WIRE**



Pheoll Manufacturing Company, Inc.

**Swivel base for truck rear view mirror passes
 toughest tests before it hits the road!**

Pheoll Manufacturing Company, Inc., Chicago, Illinois, assigned to produce the square-shouldered cup screw shown here, asked Keystone Steel & Wire Company for the exact cold heading wire. Keystone's Metallurgists developed double extrusion coated special processed quality wire.

Finished product specifications called for a uniformly smooth cupped surface, free of burrs for proper adjustment of the mirror. This is consistently achieved by Keystone Wire's quality control during every step of wire manufacture from open hearth steel making to finished wire.

Because this cup screw must withstand the rigors of the road, it is given the toughest tests to check head stress and ductility. Held in a vise, the shank is struck repeatedly until it is bent 90° without fracture. The cup portion gets similar treatment.

The success of this cold-headed square shouldered cup screw is due to the superior *flowability* of Keystone Special Processed Wire, another example of proper chemical analysis, correct thermal treatment and consistent uniformity throughout every coil.

Why not take advantage of the service offered by Keystone Metallurgists who will analyze your specifications and recommend the wire just right to solve your particular wire problems? Talk with your Keystone Representative for complete details, or write us, sending your part and blue prints, if possible.

Keystone Steel & Wire Company, Peoria, Illinois



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IT'S A
SIMPLE
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CASE
WITH
RIVNUTS®

Designers of this pushbutton station, Gemco Electric Company of Detroit, required an oil-tight enclosure with a cover that could be attached or removed as simply as possible. The usual solution would be clamps and brackets. Instead, RIVNUTS were installed in the frame so that the cover could be fastened to them with ordinary screws. With RIVNUTS as sturdy nutplates, time and cost of assembly is greatly reduced. There's no need for drilling and tapping blind holes. And RIVNUTS with closed ends effectively

seal against leakage of oil along screw threads.

RIVNUTS are the first one-piece blind rivets with internal threads. They help solve many fastening problems faster—better, and at reduced cost. New data book describes principle, typical applications, lists sizes and tool data. For a free copy write Department AE-5,

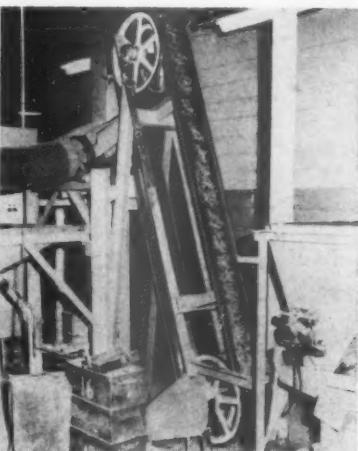
*B.F.Goodrich
Aviation Products,
a division of
The B.F.Goodrich
Company,
Akron, Ohio.*



most instantaneous, requires no heat or catalyst and is stronger than the facing material itself.

**STEEL BELT CONVEYOR
CARRIES NAILS UPHILL**

Engineers at a large Montreal, Canada steel company are using a near-vertical steel belt conveyor to carry a steady stream of nails from a floor-mounted hopper to the overhead infeed chute of an annealing furnace. Magnets positioned behind the load-carrying strand pull the nails from the hopper to belt, and hold them against it during their upward journey.



Because of the rapid deterioration of composition or fabric belts due to puncturing and tearing, a steel belt conveyor, supplied by Sandvik Steel, Inc., Fair Lawn, N.J., was used.

The belt is made from strip steel especially trued and flattened at the mill for conveyor application. It has two rubber V-ropes bonded to the under side, which run in grooved terminal sheaves and provide true trucking for the belt.

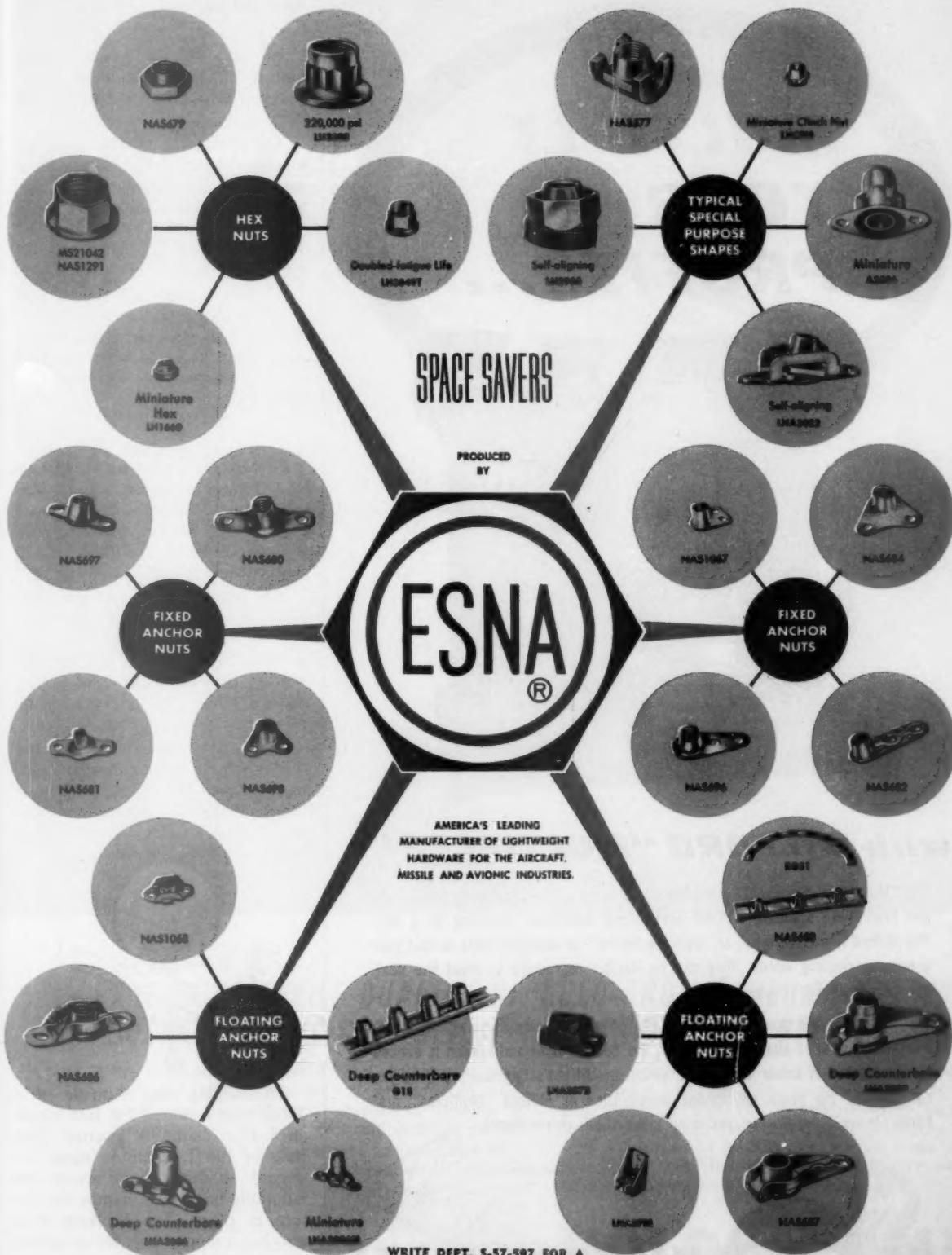
The pull of the magnets worked so well that additional V-ropes bonded near the outer edges of the conveyor to keep the nails from falling off, were found to be unnecessary.

**HIGH BRAZING, HARDENING
RATE WITH MANUAL UNIT**

A manually operated brazing and hardening unit built by Induction Heating Corp., processes two rocker arms in seven seconds.

continued

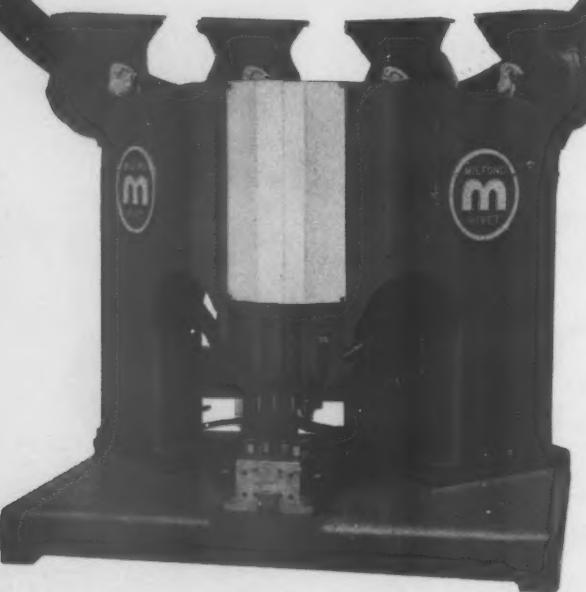
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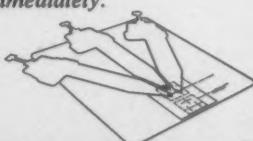
With MILFORD "MULTIPLES!"

The "Multiples" that keep assembly costs down while increasing production and profits are standard Milford rivet-setting machines operating as a unit. The Milford line is designed as "building blocks" for multiple units to suit your automatic riveting needs. They can be flexibly regrouped to meet the next, low cost assembly requirement.

The narrow wedge shape of Milford's No. 56 and 57 permits grouping to set rivets head to head and, when grouped, the cost of labor and burden is divided by the number of heads in the unit. Write for Milford's Engineer's Kit, so you can explore the profit multiplying possibilities of Milford "Multiples" first hand. Or we'll be glad to quote on your needs immediately.



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**MILFORD RIVET
& MACHINE CO.**

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ELYRIA, OHIO • AURORA, ILLINOIS • HATBORO, PA

By changing the fixtures, other automotive parts, such as water pump shafts can be treated by the same unit.

The process itself involves manual loading and unloading. The cycle is started by the operator, after the parts have been clamped into position, and moved forward into the work coil area, he then loads the alternate position.

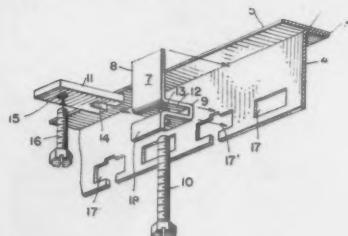
To insure that each station performs on schedule, a memory circuit built in the control circuit takes over and starts the cycle after the heat cycle of the alternate side has been completed.

MOUNTING CLAMP PERMITS PREASSEMBLY OF SEAL RINGS

A fixture mounting clamp permits the preassembly of a flanged sealing ring to the fixture, before it is permanently mounted onto a table or bench surface.

The principal improvements over previous mounting means for such fixtures, in addition to the preassembly feature, are that the assembly provides a self-supporting surface while the fixture is being positioned, plus easy removal.

While the clamp is used primarily for mounting counter-top sinks, basins, gas and electric cooking ranges, it has wide application where any fixture is to be mounted flush with a working surface.



The sealing ring is made of a T-bar with a slotted leg, into which an L-type clamp is inserted. The base of the L-clamp is made U-shaped, so that it may accept the mounting bar which clamps the fixture in place. The L-clamp base also has a tapped hole for accepting the initial clamping bolt.

To preassemble the flanged fixture and mounting ring, the L-clamp is inserted into the T-bar

continued

Think Quality...



THE CONSISTENT QUALITY OF HOLO-KROME THERMO-FORGED* SOCKET SCREWS CUTS REJECT AND IN-WARRANTY SERVICE COSTS

Are inspection, in-warranty and replacement costs putting a tight squeeze on your profits? Join other profit-conscious industrial leaders in turning to quality to reduce these costs and increase profits. THERMO-FORGED socket screws are produced by a patented electronic forging process which pre-conditions the metal. This makes possible exact control of metal flow, and allows us to maintain tolerances impossible with other forging methods. Thread rolling and subsequent operations are controlled more precisely than ever. As a result, THERMO-FORGED socket screws are unmatched in quality,

free from flaws, checks and hidden imperfections, with dimensional precision unattainable with ordinary forging methods. THERMO-FORGED socket screws can materially increase your profits by reducing rejects and in-warranty service costs. See your authorized Holo-Krome distributor or write for more information.



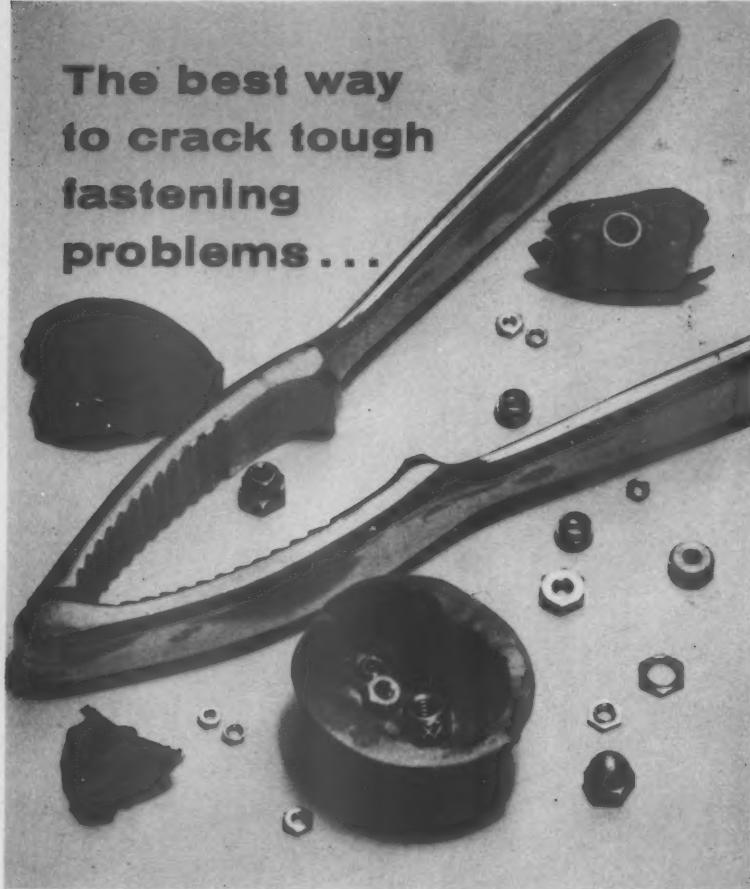
*Trade Mark of The Holo-Krome Screw Corporation

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slots, and the bolt is driven up through the tapped hole.

The fixture is then placed under the inside cross-arm of the T-bar, and the bolt is drawn up tightly, clamping the flange of the fixture to the underside of the cross-arm.

The entire fixture is then placed into a suitable opening. The unit is then mounted onto the working surface by means of a bifurcated bar, which fits into the U-shape of the first clamp. A tapped hole in the bar accepts a bolt, which is drawn up tightly against the working surface, as shown in the accompanying photos.

PROPER MATERIAL CHOICE RAISES PRODUCTION RATE

By careful analysis of the forming properties and grain structure of thin gage brass, used for a three piece nickel-plated whistle, Buglecraft, Inc., Long Island City, N.Y. has been able to increase production by more than 1300%.



Proper selection of brass materials increased production of this three piece whistle 1300%.

A fine grain brass originally selected for the whistle components offered excellent forming and plating characteristics. Complete joining, however, was slow and frequently unpredictable since the solder tended to flow rather than wet the metal at the joints. Slightly different spring characteristics of the thin gage inner coil often caused the coil to separate from the tongue during the soldering operations.

Selecting brass with grain sizes recommended by Bridgeport Brass Co., production was increased from 700 whistles per man, per day to 1200 per hour, per man.

The three brass stampings which form the basic whistle assembly, an outer coil, an inner coil forming the tongue, and body are joined simultaneously by a single-step soldering operation.

PQA

proves it...

breaking point tests show
Allen screws are
consistently better

*PRODUCT QUALITY ASSURANCE

PQA is the symbol of unquestioned quality at Allen. It stands for constant quality control from rigid upgrading of incoming raw materials to final, *unconditionally guaranteed* shipment to you.

To give you some idea: Federal Spec. FF-S-86a calls for 4,950 lbs. for the $\frac{1}{4}$ -20 cap screw. Day-in, day-out breaking point tests of these screws prove that Allens are *consistently* better . . . well above the minimum requirement!

Quality checks like this one confirm PQA every step of the way through Allen's manufacturing process. And to help you keep costs down and profit margins up, Allen manufactures 1457 standard sizes.

Remember . . . it costs you no more to have *genuine* Allens right from stock, and they are only a minor fraction of your assembly costs.

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May, 1961



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all stamped with the T-MARK of total reliability

Other spring fasteners may *look* like Tinnerman SPEED NUTS. But only those stamped with the T-mark really *are* SPEED NUTS, made to Tinnerman's high, precise standards of reliability. Tinnerman quality controls are the most stringent in the industry. And only Tinnerman stocks a *half-billion* SPEED NUTS . . . is tooled to turn out 10,000 variations . . . develops 25 *new* designs each week. Protect your product's good name by insisting on genuine SPEED NUTS. Stamped with the Tinnerman "T"—the mark of total reliability. *Tinnerman Products, Inc., Department 12, Box 6688, Cleveland 1, Ohio.*

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GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales.
FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine).
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THE ROLE OF JOINT DESIGN IN FURNACE BRAZING

Lap Joint

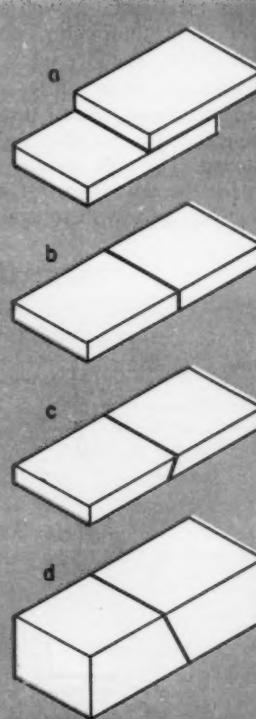
The strongest joint; should be used whenever possible. Best when the overlap is more than three times as great as the thinnest member. Has the disadvantage of using additional metal and requiring extra space.

Butt Joint

The weakest joint; should be avoided whenever possible. Has the advantage of requiring no extra space.

Scarf Joints

Not as strong as lap joints, but take up no more space than butt joints. May be difficult to prepare and to hold during brazing.



by Roy N. Omans
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The art and science of metal brazing is seemingly ageless. It is one of the oldest known methods of metal joining, dating back to the Etruscan craftsmen who produced brazed gold jewelry ornaments several centuries B.C. The reason for this longevity is obvious. Brazing, and especially copper furnace brazing, is one of the fastest, most economical, and most efficient processes available for producing complex, strong and dependable integral metal parts. In many cases, brazing is the only practicable method for producing such parts.

But as with all industrial processes, the best results in brazing can be anticipated only when all process limitations are recognized and rigidly avoided, and when all process advantages are exploited to the full. This implies that from the design stage through final inspection, anyone who has anything to do with a brazed part should have a knowledge of these process advantages and limitations. That old "weakest link in the chain" adage applies very well to the cycle of design and production operations that lead to a finished and inspected brazed part.

As the design engineer is the first "link" in this hypothetical chain, upon his shoulders rests the responsibility

continued



Here, engine valves both large and small, and with filler metal properly placed, enter brazing furnace on a continuously moving conveyor.

sibility of designing a joint configuration which can be properly brazed with minimum time and effort. The best of brazing techniques cannot compensate for poor joint design. Good design for efficient brazing implies as well that the parts to be joined can be easily jigged for brazing, that placement of the filler metal can be easily accomplished, and that the brazed joint can be visually inspected after brazing. Violation of any one of these requirements may do much to offset the economic and speed advantages of the brazing process.

We at Fabriform have been specializing in brazing for three decades, producing parts for commercial industries at large, as well as for the military aircraft and missile industries.

From this flow of work, coupled with our own research, we have evolved standards of what constitutes a good brazed joint, as well as design principles which must be adhered to for optimum brazing results. These principles apply not only to the strength of the joint itself, but to the ease and speed at which brazing can be accomplished, and to the effects of design on the service life of brazed products.

The purpose of this article is to set forth these principles as they apply to parts intended for furnace brazing. There will be exceptions, of course, as joint design is as varied as the products produced by industry. But in most cases, these principles will aid the engineer in designing a joint for efficient, economical, and optimum brazing results.

First, let us cast a scientific eye on the brazing process itself. Brazing is a metal-joining process in which the parts are joined by flowing a filler metal between the joint interfaces. When properly selected, this filler metal will alloy with the parent metal to give the joint predetermined physical characteristics. The distance or "fit" between the joint interfaces is very critical. Preferably, this should be a metal-to-metal fit with just enough surface roughness (approximately 125 microinches) so that the filler metal will be drawn into the joint by capillary action. This will assure equal distribution of the filler

metal—upward, downward, and sidewise—throughout the joint area.

If the gap between the joint interfaces is too wide, this capillary action will be destroyed; the layer of filler metal between the joint interfaces may be so thick that it will not properly alloy with the parent metals on either side. This will reduce joint strength to that of the original filler metal itself. So one of the paramount principles of good design for brazing is proper joint fit prior to brazing—a joint fit that will promote capillary action and keep the layer of filler metal thin enough so that it will alloy thoroughly with the parent metals on either side.

During the study of his design, the engineer may wonder just where brazing can be most advantageously employed. The only answer to this is to list the advantages of brazing so that he can test them against his

own particular design requirements.

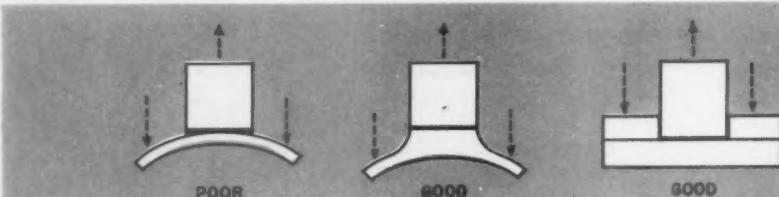
One of the biggest advantages of brazing is that intricate assemblies can be fabricated from simple parts. Parts which are difficult or costly to make in one piece, and where an excessive amount of metal would be wasted during machining, can be assembled from a number of "easy-to-produce" components properly brazed together.

In our work here at Fabriform, we have encountered situations wherein this one big advantage paid tremendous dividends. In one case, a commercial outboard motor manufacturer was bidding on a big contract. The slight bid margin that gave him the job accrued from using a brazed crankshaft component rather than one machined from a solid piece of metal. From the quality standpoint, and in tests conducted to prove the design, the

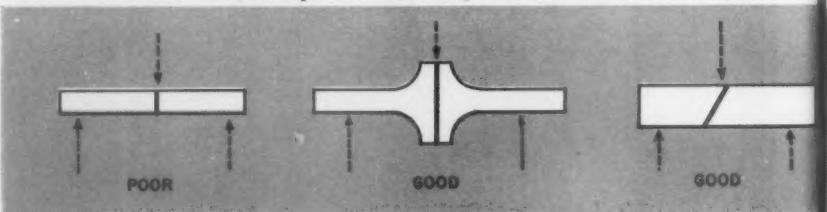
GOOD BRAZING PRACTICES - - -



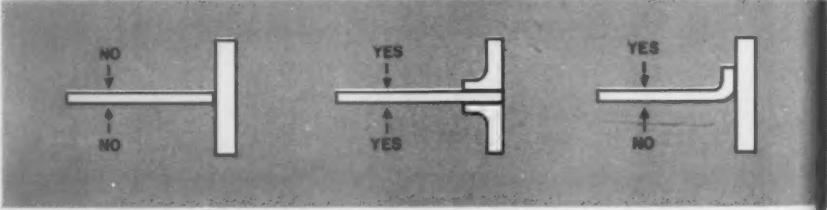
Two Ways to Prevent Tearing



Two Ways to Avoid Couples at the Joint



Ways to Improve Impact Strength



brazed crankshaft outperformed those machined from solid stock.

Another advantage of brazing is that assemblies can be fabricated from parts made from dissimilar ferrous alloys. Thus a high cost alloy can be used just where it is needed in an assembly, with low cost alloys used for the remainder of the parts.

A well designed brazed joint exhibits uniform strength throughout the joint area, and uniform strength throughout a production run. Brazing creates very low, if any, residual stress in a part; heat distortion is greatly minimized. The brazed parts are clean and bright; in most cases little or no machining is required after brazing. Finally, furnace brazing can be accomplished at a high production rate and with a minimum of specialized tooling.

When the design engineer has

determined where brazing can be advantageously employed, his next consideration is the design of the joints to be brazed. Here again, because of the numerous joint designs possible, only guide posts can be established. But in nearly all cases the principles depicted by these guides can be applied to the joint under question.

As indicated, joint fit prior to brazing is of paramount importance. Metal-to-metal contact at the interfaces is preferred, with just enough surface roughness so that capillary action will occur. As this capillary action progresses, the filler metal (as it alloys with constituents from the parent metal) will make room for complete interface penetration even though the interfaces may be in physical contact at the start of the process. As capillary action counteracts the force of gravity, the

filler metal will flow upward as well as downward between the interfaces. If the interfaces are so widely spaced that no capillary action occurs, the flow will be only downward (in conformance with the pull of gravity). The layer of filler metal thus formed will be too thick for optimum alloying with parent metal constituents.

Another problem the designer must face is how to keep the parts in position during brazing. Expensive jiggling and aligning fixtures should be avoided as they only add to the cost of the part and may slow its production. One widely used solution to this problem is to design the assembly so that the parts are self-jigging. This implies that when the parts are assembled for brazing, they will be held together and in alignment by a mechanical feature inherent in the design itself.

Press fits are commonly used to give male and female parts this self-jigging characteristic. The mechanical friction between the press fit interfaces will hold the parts together and in alignment during the brazing process. Swaging, knurling, staking, peening, and crimping are other metal-to-metal techniques employed to provide sufficient mechanical friction or interference to keep the parts in place during brazing. When none of the above techniques can be used, the parts may be preassembled by pinning, bolting, riveting, tack welding, or spot welding. Where low-cost brazing is desired, these pre-assembly joints should be strong enough so that additional jiggling is not required during brazing.

There are only two basic types of joints used in brazing. One is the butt joint where part components are joined end-to-end. The other is the lap joint where the part components are lapped over each other with the area of the lapped interfaces being used for brazing. Many variations and combinations of these joint types occur in design work. From the design strength standpoint, as much interface area as is compatible with the design should be allowed.

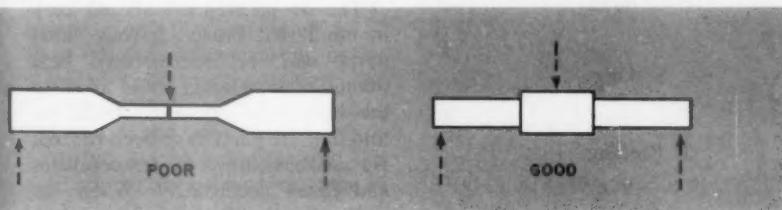
Because of its minimum interface area (the area where brazing will actually take place) the butt joint is the weakest type of joint and should be avoided whenever possi-

continued

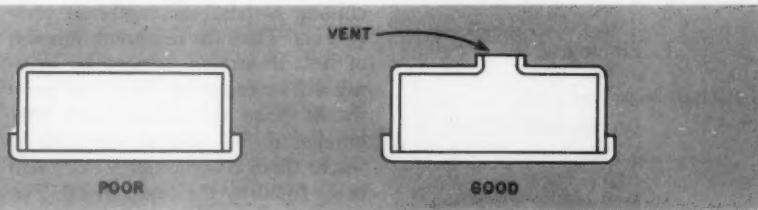
DO's and DON'Ts FOR DESIGNERS



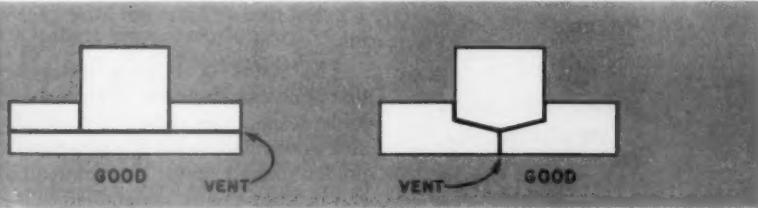
How to Increase the Fatigue Life of Axle and Hub



Sleeve Increases Life of Rotating Beam

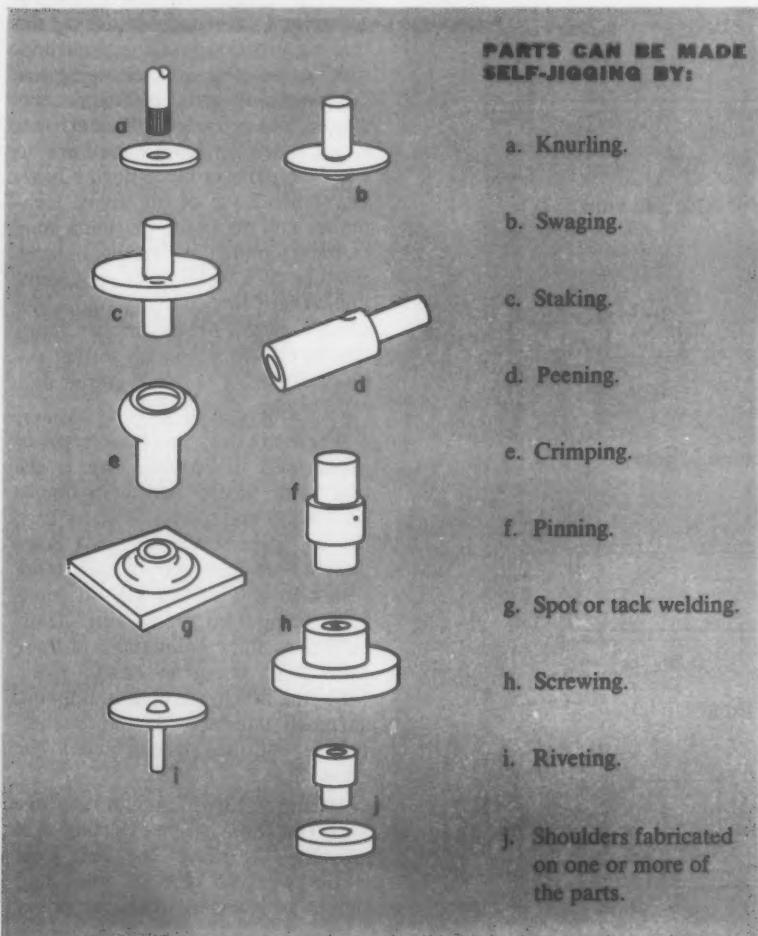


Vents Prevent Pressure Build-Up





Here the many parts used in a hydraulic transmission component have been set up for furnace brazing. This is an excellent example of how very complicated assemblies can be produced by brazing together a number of relatively simple-to-produce parts.



ble. When space permits, it is possible to increase the strength over that obtainable from a straight butt joint by scarfing the joint, or designing it at an angle. This increases the interface area.

The lap joint is much the stronger of the two. Maximum joint strength is secured when the overlap is more than three times as great as the thinnest member in the assembly being brazed. Disadvantages of the lap joint are that it requires more material, more space, and will result in greater weight.

DESIGN DO'S AND DON'TS

In addition to the above general design considerations, there are some practical "do's" and "don'ts" which the design engineer must keep in mind. Some of these have to do with joint strength only; others affect the strength of the assembly after it is brazed; still others make it possible to inspect the joint properly after it is brazed, or aid in avoiding or emphasizing design details which will hinder or help the actual brazing process itself.

The brazed joint design diagrams presented herewith depict many of the "do's" and "don'ts" visually.

The design engineer should keep in mind that brazed ferrous metal parts can be successfully heat treated after brazing, but in all cases the heat treat operator should be told that the parts have been brazed. He can thus control his temperatures and times accordingly. When the finished part must meet very close tolerance requirements, finish machining is best accomplished after brazing. Thus the minimum amount of heat distortion induced by brazing will be removed. Threaded parts should have the threads cut after brazing if the threads are located where there is some danger of them being filled by the braze metal. The same applies to small holes which might be filled with the braze metal. It's best to drill them out after brazing.

The status of brazing today is that of an exact science. With correct joint design, the right filler metal, and controlled brazing procedures, predetermined joint characteristics can be consistently maintained. •

by W. T. Appleberry
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PART 2

HOW FASTENER TENSION VARIES WITH EXTERNAL JOINT LOADS

In the preceding article—the first in a series of three articles concerned with fastener preload theory—we outlined the following points:

1. A method of reducing the stress cycle amplitude in a fastener without incurring a weight penalty. The solution: high preload or initial tension achieved during installation. By thus reducing the amplitude, fatigue life is lengthened, and the result may properly be called "life insurance."

2. Derivation of load formulae for both fastener tension and joint compression. The end result is to show that fastener tension under service tension load is always more than preload alone, and is less than the sum of the two.

As an aid in accomplishing the derivations, the primary concept of elasticity in both the fastener and the joint is of importance. Both may be thought of as springs (one in tension and the other in compression) exerting force on each other. While the fastener tension was found to equal the preload plus a portion of the service load, the joint compression was correspondingly equal to the preload minus a different portion of the service load. A formula of some usefulness was obtained which gave the service load needed to bring compression to zero.

3. The fastener cross-sectional area was corrected empirically for thread stretch.

The area of the joint under compression is (for a short bolt) approximately equal to the washer face

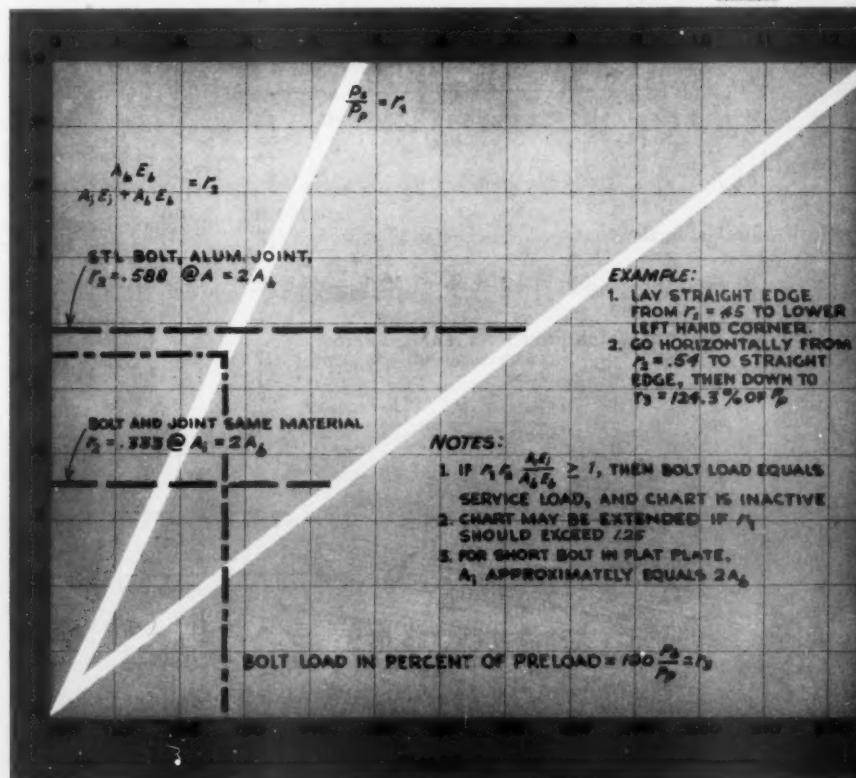
area, but this must be corrected for longer bolts. The effective area under compression is assumed to be circumscribed by a dispersion line of $22\frac{1}{2}^\circ$ with the bolt axis, originating at the bolt face periphery on one side of the joint, and the washer face periphery on the other side. The area is taken at the intersection of the two dispersion cones which

would be midway of the joint thickness.

4. A chart was provided which gives the tension load in a fastener under any service load.

We will now demonstrate in Part 2 the use of the formulae and the chart through example problems. Then we will further clarify the underlying concepts involved by in-

continued



vestigating the limiting cases, i.e., an infinitely rigid fastener, or joint, and the point at which joint compression reaches zero. On the charts provided to illustrate these unique cases, the performance of two typical joints is also shown: (1) a steel fastener in an aluminum joint, and (2) a fastener and joint of the same material.

Chart 1, as well as Equations 3, 4, 5, 9, 12, 13 and 16 from Part I (together with the Abbreviations), are required for use with the following example problems.

EXAMPLE #1

A. Using bolt load equation (3)

$$(1) \text{ Given that } P_p = 3000, E_b = 29.5 \times 10^6, \\ E_j = 10.3 \times 10^6, A_j = 2A_b, P_s = 1200.$$

$$(2) \text{ Then } P_b = P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s = \\ 3000 + \frac{A_b \times 29.5 \times 10^6}{2A_b \times 10.3 \times 10^6 + A_b \times 29.5 \times 10^6} 1200 =$$

$$3000 + \frac{29.5 \times 1200}{20.6 + 29.5} = 3000 + .588 \times 1200 = 3707 \text{ lb.}$$

B. Using the other version of the bolt load formula

$$P_b = (1 + r_1 r_2) P_p, \quad (5)$$

$$P_b = (1 + \frac{1200}{3000}) \cdot \frac{A_b \times 29.5 \times 10^6}{2A_b \times 10.3 \times 10^6 + A_b \times 29.5 \times 10^6}$$

$$3000 = (1 + .4 \times .588) 3000 = 1.2356 \times 3000 = 3707 \text{ lb.}$$

C. Using the chart:

$$r_1 = .4, r_2 = .588, r_3 = 123.6\% \text{ of } 3000 = 3708 \text{ lb.}$$

D. Point at which joint load reaches zero

$$P_s = \frac{A_j E_j + A_b E_b}{A_j E_j} P_p = \frac{2A_b \times 10.3 \times 10^6 + A_b \times 29.5 \times 10^6}{2A_b \times 10.3 \times 10^6} P_p$$

$$3000 = \frac{20.6 + 29.5}{20.6} 3000 = 2.432 \times 3000 = 7296 \text{ lb.}$$

- (1) Proof (the bolt load must equal the service load)

$$P_b = P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s = \quad (3)$$

$$3000 + \frac{A_b \times 29.5 \times 10^6}{2A_b \times 10.3 \times 10^6 + A_b \times 29.5 \times 10^6} 7296 =$$

$$3000 + \frac{29.5}{20.6 + 29.5} 7296 =$$

$$3000 + .588 \times 7296 = 3000 + 4297 = 7297 \text{ lb.}$$

Example #2 (using chart only) 1/2" dia. steel bolt of 1-3/4" grip through two tension fittings and a thin sheet:

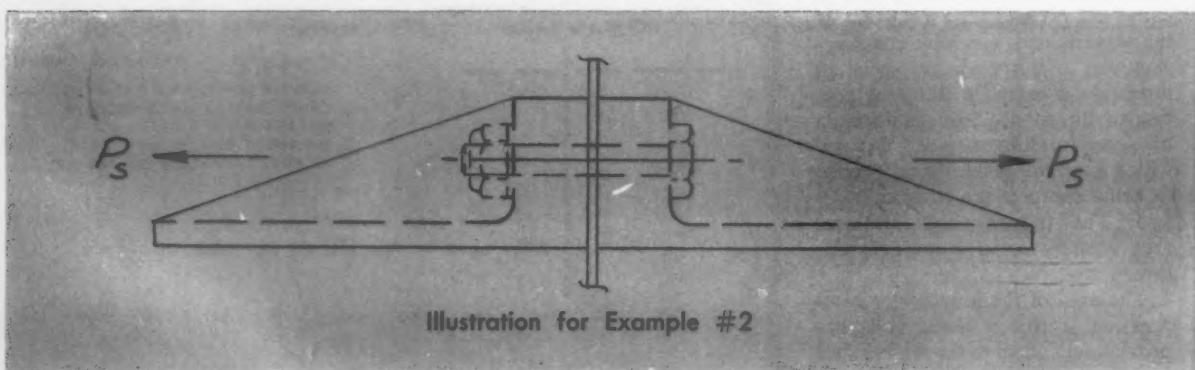
Preload, $P_p = 18679$ lb.; service load, $P_s = 2/3$ of ultimate bolt strength = $2/3 \times 26300 = 17433$ lb.; shank area, $A_b = .1925$ (undersize bolt).

$$A. r_1 = 17533/18679 = .9386$$

$$(1) A_{bc} = .1925 \frac{1.75}{1.75 + .374} = .1925 \times .8239 = .1586$$

(2) Since this particular fitting base falls within the 45° dispersion zone (see Fig. 2), assume A_{jc} is based on a diameter lying between the minimum fitting base width, D_f , and the bolt face diameter:

$$D_{jc} = \frac{D_f + D_{bf}}{2}$$



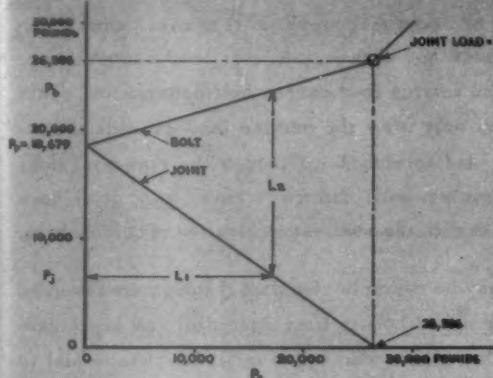


CHART 2

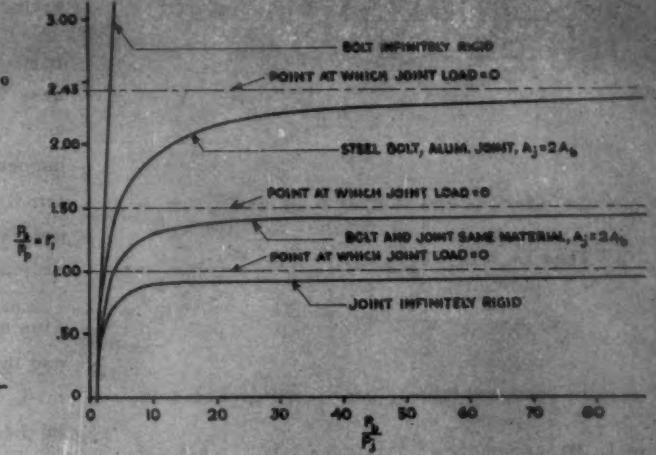


CHART 3

$$A_{jc} = \frac{\pi}{4} (D_{jc}^2 - D_h^2),$$

$A_{jc} = 1.073$ (based on an existing tension fitting)

$$(3) r_2 = \frac{.1586 \times 29.5 \times 10^6}{1.073 \times 10.3 \times 10^6 + .1586 \times 29.5 \times 10^6} = \frac{4.6787}{11.0519 + 4.6787} = .2974$$

$$(4) r_3 = 128\% \text{ of } 18679 = 23,909 \text{ lb., which is } 91\% \text{ of ultimate and } 102\% \text{ of yield.}$$

B. Point at which joint load reaches zero

$$P_s = \frac{1.073 \times 10.3 \times 10^6 + .1586 \times 29.5 \times 10^6}{1.073 \times 10.3 \times 10^6}$$

$$18679 = \frac{15.7306}{11.0519} 18679 = 1.423339 \times 18679 = 26,586 \#,$$

which slightly exceeds the ultimate strength of the bolt, and since these formulae only operate within elastic limits, joint load would reach zero prior to this indicated point. The stress-strain curve for the bolt would precisely locate the point (where strain equals preloaded bolt strain plus maximum joint strain).

Assuming, only to show the validity of the formulae, that we are within elastic limits, we may prove the

point to be correct since bolt load would equal service load.

$$P_b = 18679 + \frac{.1586 \times 29.5 \times 10^6}{1.073 \times 10.3 \times 10^6 + .1586 \times 29.5 \times 10^6}$$

$$26586 = 18679 + \frac{4.6787}{11.0519 + 4.6787} 26586 =$$

$$18679 + .2974 \times 26586 = 18679 + 7907 = 26,586 \#$$

Charts Illustrating Rates at Which Bolt Load Increases, and Joint Load Decreases

A. Chart No. 2 shows load condition in example No. 2

(1) Assume $L_1 = L_2$. Then $L_1 = P_s$, $L_2 = P_b$.

$P_j = P_b - P_s$, $P_b = P_s + P_j$, which is equation

(2). This proves that for any condition, $L_1 = L_2$.

B. Charts for the general case

Assume $A_j = 2A_b$

(1) Chart #3

The ratio of bolt load to joint load equals

$$\frac{P_b}{P_j} = \frac{\frac{P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s}{P_p - \frac{A_j E_j}{A_j E_j + A_b E_b} P_s}}{P_p} = \frac{\frac{E_b}{2E_j + E_b} P_s}{\frac{P_p}{P_p - \frac{2E_j}{2E_j + E_b} P_s}},$$

continued

$$\frac{P_b}{P_j} = \frac{1 + \frac{E_b}{2E_j + E_b} \cdot \frac{P_s}{P_p}}{1 - \frac{2E_j}{2E_j + E_b} \cdot \frac{P_s}{P_p}} . \quad (18)$$

$$(a) \text{ When } E_b = E_j, \frac{P_b}{P_j} = \frac{1 + \frac{1}{3} \cdot \frac{P_s}{P_p}}{1 - \frac{2}{3} \cdot \frac{P_s}{P_p}} = \frac{3 + \frac{P_s}{P_p}}{3 - 2 \cdot \frac{P_s}{P_p}} .$$

This ratio becomes infinite as P_j approaches zero,

$$\text{or as } P_s/P_p \text{ approaches } 1.5: \frac{P_b}{P_j} = \frac{3 + 1.5}{3 - 2 \times 1.5} = \frac{4.5}{0} = \infty$$

(b) When $E_b = 2.86E_j$ (steel bolt, aluminum joint),

$$\frac{P_b}{P_j} = \frac{1 + .588 \frac{P_s}{P_p}}{1 - .411 \frac{P_s}{P_p}}$$

This becomes infinite as P_s/P_p approaches 2.43

$$\frac{P_b}{P_j} = \frac{1 + .588 \times 2.43}{1 - .411 \times 2.43} = \frac{1 + .588 \times 2.43}{1 - 1} = \infty$$

(c) When $E_b = \infty$ (bolt and nut infinitely rigid),

$$\frac{P_b}{P_j} = \frac{1 + \frac{\infty}{2E_j + \infty} \cdot \frac{P_s}{P_p}}{1 - \frac{2E_j}{2E_j + \infty} \cdot \frac{P_s}{P_p}} = \frac{1 + \frac{P_s}{P_p}}{1 - 0} = 1 + \frac{P_s}{P_p} .$$

Since the infinitely rigid bolt could never permit the joint load to change, P_j will always equal P_p . Therefore

$$\frac{P_b}{P_j} = \frac{P_b}{P_p} = 1 + \frac{P_s}{P_p}, \text{ or } P_b = P_p + P_s$$

(d) When $E_j = \infty$ (joint infinitely rigid),

$$\frac{P_b}{P_j} = \frac{1 + \frac{E_b}{2 \times \infty + E_b} \cdot \frac{P_s}{P_p}}{1 - \frac{2 \times \infty}{2 \times \infty + E_b} \cdot \frac{P_s}{P_p}} = \frac{1 + \frac{1}{P_s}}{1 - \frac{1}{P_s}} = \frac{P_p}{P_p} = 1 .$$

This becomes infinite as P_s/P_p approaches one, or as the service load approaches the preload.

It may be noted that since, in this case, joint thickness does not change, the bolt load cannot change until the service load causes bolt deformation. This happens only after the service load exceeds the internal load (preload). Although the bolt load does not increase until stretch occurs, joint load does decrease with the smallest application of service load.

This may be easier to visualize if things are reversed and the naked bolt is first stretched, say one-eighth inch, then surrounded by an inflexible joint equal in thickness to the stretched grip of the bolt. Pausing here, the joint has no load on it, but the bolt is carrying the full service load. Now as the service load is reduced slowly, say by removing a series of weights one at a time, the joint just as slowly picks up the service load until it carries it entirely as pre-load. The bolt has neither changed in length nor load during this operation. Bolt and joint loads are equal to each other and to the service load previously removed. The joint equation bears this out:

$$P_j = P_p - \frac{A_j x \infty}{A_j x \infty + A_b E_b} P_s = P_p - P_s .$$

The bolt equation similarly agrees:

$$P_b = P_p + \frac{A_b E_b}{A_j x \infty A_b E_b} P_s = P_p + P_s = \text{a constant.}$$

When the bolt load begins to increase, a gap will immediately appear in the bolted joint, P_b will equal P_s , and the formulae cease to operate.

(2) Chart #4

Service load and bolt load, both over the same quantity, P_p , are compared, thus plotting r_1 versus $\frac{r_3}{100}$ (see Chart No. 1.)

$$\frac{P_b}{P_p} = \frac{P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s}{P_p} = \frac{P_p + \frac{E_b}{2E_j + E_b} P_s}{P_p} ,$$

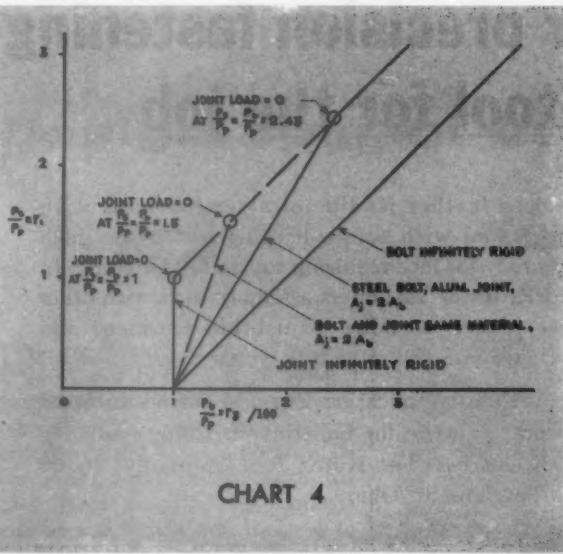


CHART 4

$$\frac{P_b}{P_p} = 1 + \frac{E_b}{2E_j + E_b} \cdot \frac{P_s}{P_p} \quad (19)$$

(a) When $E_b = E_j$, $\frac{P_b}{P_p} = 1 + \frac{P_s}{3P_p}$.

At the point where $P_s/P_p = 1.5$, P_b/P_p yields the same:

$$\frac{P_b}{P_p} = 1 + \frac{1}{3} \times 1.5 = 1.5, \text{ so at this point,}$$

$$\frac{P_b}{P_p} = \frac{P_s}{P_p}, \text{ or } P_b = P_s.$$

The slope of the line changes, which is because the joint ceases to push on the bolt. P_j drops to zero, the bolt and joint formulae become invalid, and a gap begins to appear in the joint. If this gap were visible, the formulae would scarcely be needed since P_b would obviously equal P_s .

(b) When $E_b = 2.86E_j$ (steel bolt, aluminum joint),

$$\frac{P_b}{P_p} = 1 + \frac{2.86}{2 + 2.86} \cdot \frac{P_s}{P_p} = 1 + .588 \frac{P_s}{P_p}$$

At the point where $P_s/P_p = 2.43$, P_b/P_p equals the same quantity:

$\frac{P_b}{P_p} = 1 + .588 \times 2.43 = 2.43$, so at this point,

$$\frac{P_b}{P_p} = \frac{P_s}{P_p}, \text{ or } P_b = P_s.$$

(c) When $E_b = \infty$ (bolt and nut infinitely rigid),

$$\frac{P_b}{P_p} = 1 + \frac{\infty}{2E_j + \infty} \cdot \frac{P_s}{P_p} = 1 + \frac{P_s}{P_p}.$$

(d) When $E_j = \infty$ (joint infinitely rigid),

$$\frac{P_b}{P_p} = 1 + \frac{E_b}{2 \times \infty + E_b} \cdot \frac{P_s}{P_p} = 1$$

(e) To further understand Chart No. 4, the variables, P_s and P_b are both over the same quantity, P_p . Therefore the chart becomes a plot of P_s versus P_b in terms of P_p . Multiplying through by P_p , equation (19) becomes

$$P_b = P_p + \frac{E_b}{2E_j + E_b} P_s$$

which is equation (3) with $A_j = 2A_b$. Equations for cases (a) through (d) are treated in like manner, as are those on the chart itself. For example:

$$\frac{P_s}{P_p} = \frac{P_b}{P_p} = 2.43 \text{ becomes } P_s = P_b = 2.43 P_p$$

As a parting thought, it may be noted that one case was omitted, that of an infinitely rigid bolt, nut, and joint. The writer leaves it to the reader to amend the formulae and say what transpires. However, as a gentle shove in one direction (not necessarily the right one) the case where both joint and bolt materials were alike has been surveyed. But how could you tighten the nut?

The gentle shove was only in the approximate direction of the correct solution. Equation (3) becomes $P_b = P_p + P_s$, but since preload would disappear when torque was removed, $P_p = 0$, and $P_b = P_s$. For the sake of safety, we'd better have a castle nut and cotter pin, but let's please permit some flexibility in the cotter pin.

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Rotor Tool broadens further its line of assembly tools with RotorK. This new tool with torque-limiting clutch sets high standards for *accuracy* for jobs requiring controlled fastening. In addition to RotorK, Rotor Tool offers assembly tools with other types of clutches—direct, positive, adjustable (cushion) and impact types—to give you *the right tool for the job*.

Call the nearby Rotor Application Engineer for an unbiased study of your work, or write for bulletins on Rotor Assembly Tools and RotorK clutches. The Rotor Tool Company, 26300 Lakeland Blvd., Cleveland 32, Ohio.



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Design special barbed latch



for the MACE missile

During its early stages of testing, the Air Force TM-76 MACE missile project at The Martin Company, Denver, encountered a small but potentially serious problem. It concerned a pair of one-pound access doors near the nose of the missile and which are designed to remain open until the missile is launched.

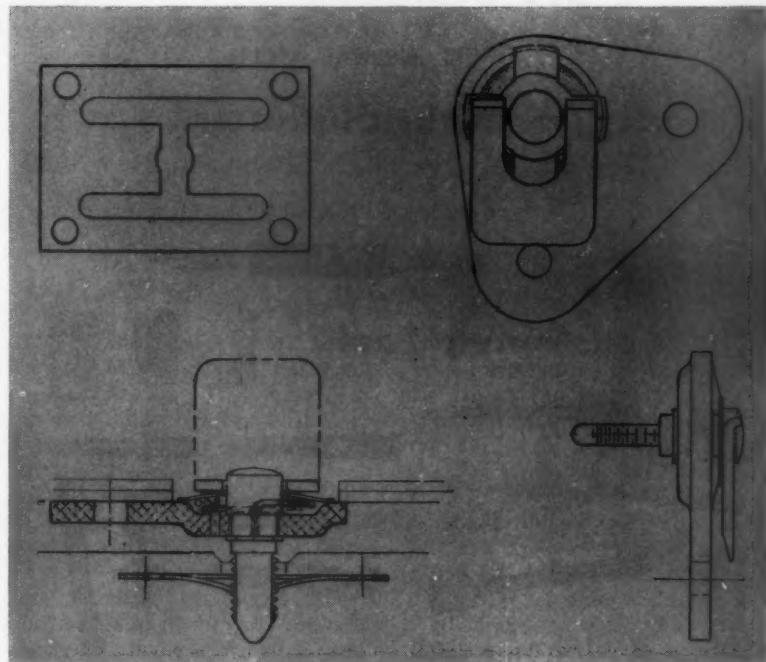
Several electronic cables are attached to the MACE through these doors, as part of its launching apparatus. The doors must remain open until the very last second. Just as the missile is launched, the cables are released by means of explosive disconnects. The spring-loaded doors close automatically in 0.25 seconds. They must close quickly and positively to avoid causing air-stream turbulence which could affect missile performance.

The problem: In closing so quickly, the lightweight doors hit their stops hard enough to rebound. Conventional latches initially used failed to prevent the doors from partially reopening. New latches had to be designed that would work positively every time and yet could still be opened and closed dozens of times by hand during the assembly and checkout of the missile.

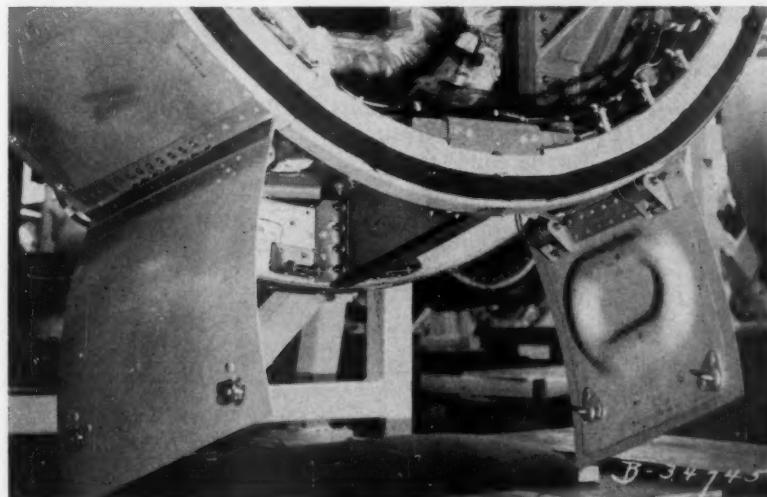
The solution: Martin engineers worked closely with designers at Adams Rite, a hardware supplier, who came up with a special barbed latch to hold this pair of access doors closed.

First consideration was given to achieving positive latching action. The age-old principle of the "barb" was selected to provide positive latching without rebound. To test this principle, Adams Rite research engineers pushed an ordinary threaded bolt into a spring clip. The force required to withdraw this bolt was well over the design require-

continued

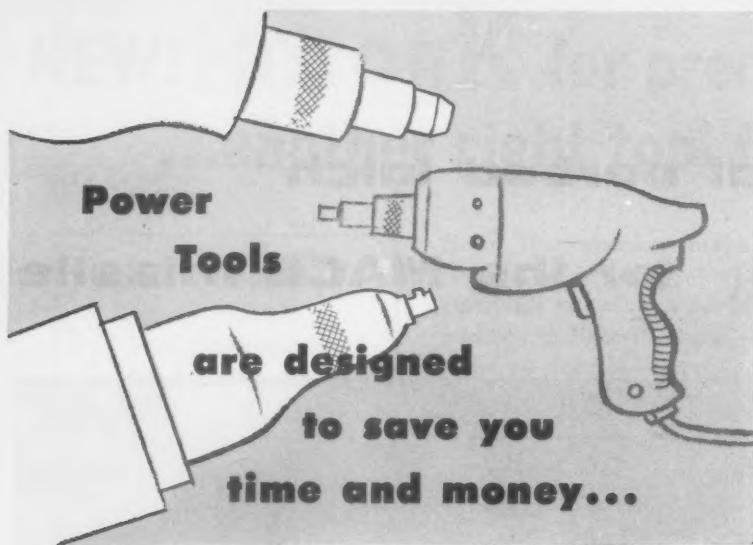


Immediately above is barbed stud engaged by spring clip. At top left is clip receptacle; front and side views of latch assembly are at right.



These one-pound access doors near the nose of MACE missile each have two of the new barbed latches which solved a potentially serious problem.

Special Missile Latch, continued



There are over 7,000 types and sizes of Apex Nut Running and Screwdriving Tools, for use with all popular makes of air and electric power tools.

NUT RUNNING TOOLS

Catalog 30-A— $\frac{1}{4}''$, $\frac{5}{16}''$, $\frac{3}{8}''$, $\frac{1}{2}''$, $\frac{5}{8}''$ square drives,
 $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ hex drives.

Catalog 30-B— $\frac{3}{8}''$, $1''$, $1\frac{1}{4}''$, $1\frac{1}{2}''$, $2\frac{1}{2}''$, $3\frac{1}{2}''$ square drives,
 $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ hex drives.

Catalog 30-D—Specials and Spline Drive.

SCREWDRIVING TOOLS

Catalog 30-C—Standard and Magnetic.

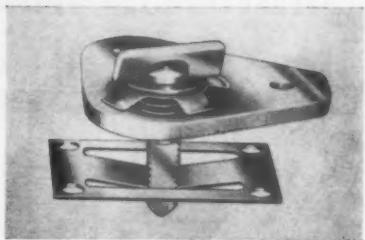


SPLINE DRIVE



FASTENING TOOLS

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This barbed latch evolved from a fastening principle discovered by man in the stone age.

ments of 200 pounds. Tests to destruction later pointed up the advisability of circular grooves, rather than helical threads, to distribute the load evenly.

Since the doors had to be opened and closed many times before launching, provision had to be made to withdraw the stud. To accomplish this, flat sides were machined on opposite longitudinal surfaces of the stud. When the stud rotates 90°, the spring clip receptacle ceased to bear on the grooves, and the latch could be opened. A spring was provided to return the stud to its locked position automatically. A flap handle was also attached to the stud so that it could be actuated by hand. This handle was designed to lie flat on the missile in the direction of the windstream.

The leading surface of the stud was bluntly pointed to permit it to seek the spring clip receptacle and enter it correctly. When the doors close, the barbed surface of the stud is engaged by the lip of the spring clip; an irreversible action is established which holds the doors tightly closed against rebound forces.

Sample latches were made and rushed to Cape Canaveral for testing in actual flight. These tests suggested modifications and refinements which were designed into the final assembly. Four of these latches are now standard equipment on every MACE missile.

C. J. Schleeweis, of Adams Rite, reports that only about 90 days elapsed from the statement of the problem to approval of the final latch.

It is interesting to note that this simple barbed latch evolved from a principle discovered during primitive man's stone age and is still applicable in today's complex space age.

MANUFACTURER'S

REFERENCE FILE-15

COMPONENT HOLDERS AS FASTENERS

Besides their role in basic product design, holders and clips can be an aid in both assembly and maintenance.

by Newton I. Meyers, Works Manager
Atlas Division, Atlee Corporation

A stable "dress" for components and leads is vital in many types of equipment. This is particularly true of the new types of solid state devices where practical assembly demands group mounting. To this end, clips and holders are versatile fastening tools which engi-

neers can use to solve certain problems in circuitry design. The right clip can offer more than neatness; it can offer the answer to problems of mechanical security and temperature control.

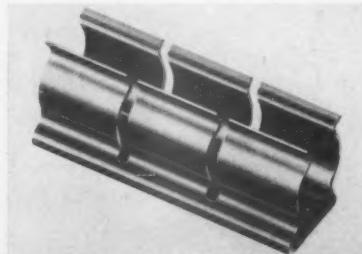
Paralleling the contribution of clips and holders as an aid in basic design is their contribution in helping solve problems associated with both assembly and maintenance. Electrical equipment, for instance, demands compact mounting and

protective devices that are easy to install, even with high speed riveting or eyeletting machines.

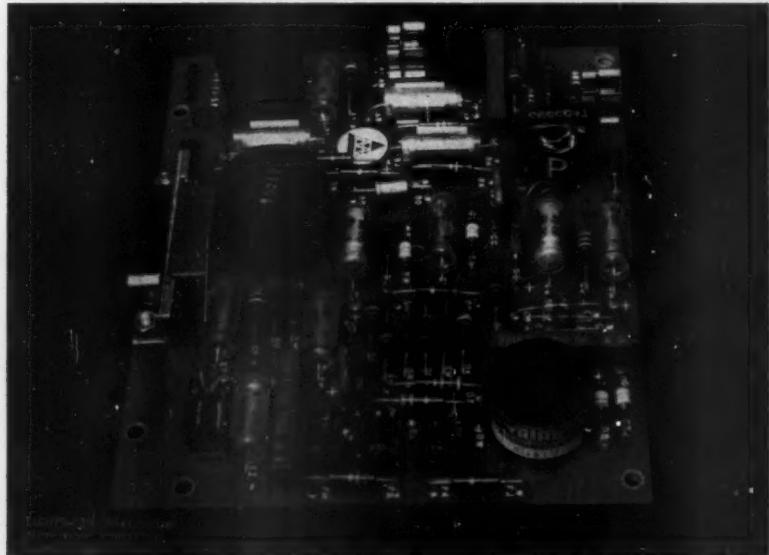
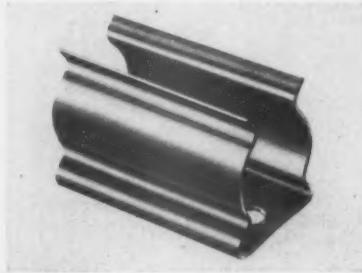
Maintenance and trouble shooting frequently require replace a component or removing a component for test purposes. Here faulty design of clips and holders can make this a difficult or even an impossible task without serious risk of damage to the components.

Materials, shapes, thicknesses, finishes and the methods of heat

continued



These typical component holders can be secured to mounting base by means of eyelets, rivets, or screws.



Regular and slotted contour holders of type shown at the left are used in this "stable dressed" microphone amplifier manufactured by Nortronics.

Component Holders, continued

treating for clips and holders must be carefully considered to give the manufacturing engineer assurance of trouble-free performance, not only in operational service, but in maintenance servicing.

Designed in cooperation with the National Bureau of Standards for guided missile use, we have developed at Atlee component holders which feature several interesting characteristics. One of the most important is a special contour design that acquires a close set to any approximately cylindrical component during shock and vibration, thereby increasing security without localized pressure. The holding power of these clips increases as shock and vibration increases, measured by the force required to remove the components.

Laboratory tests have revealed no visible shifting of a component held under vibration at 500 cps with 90G peak acceleration, and at 2000 cps with 65G peak acceleration. Neither was there any visible shifting of components during impact shocks at 2000 cps at right angles to and along the axis of the holder.

If application and maintenance of components is desired, where there will be excessive insertions and withdrawals, proper choice of material is important. Spring steel holders will withstand 100 insertions/withdrawals of a slug $1/32''$ larger than nominal diameter without metal fatigue. Beryllium copper holders, on the other hand, will withstand over 500 such withdrawal and insertion operations.

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LED-LOK is the answer for hydraulic applications as well as air and any type of fluid designed to give good results in minor vibration exposure. Below has presented a brief description of available

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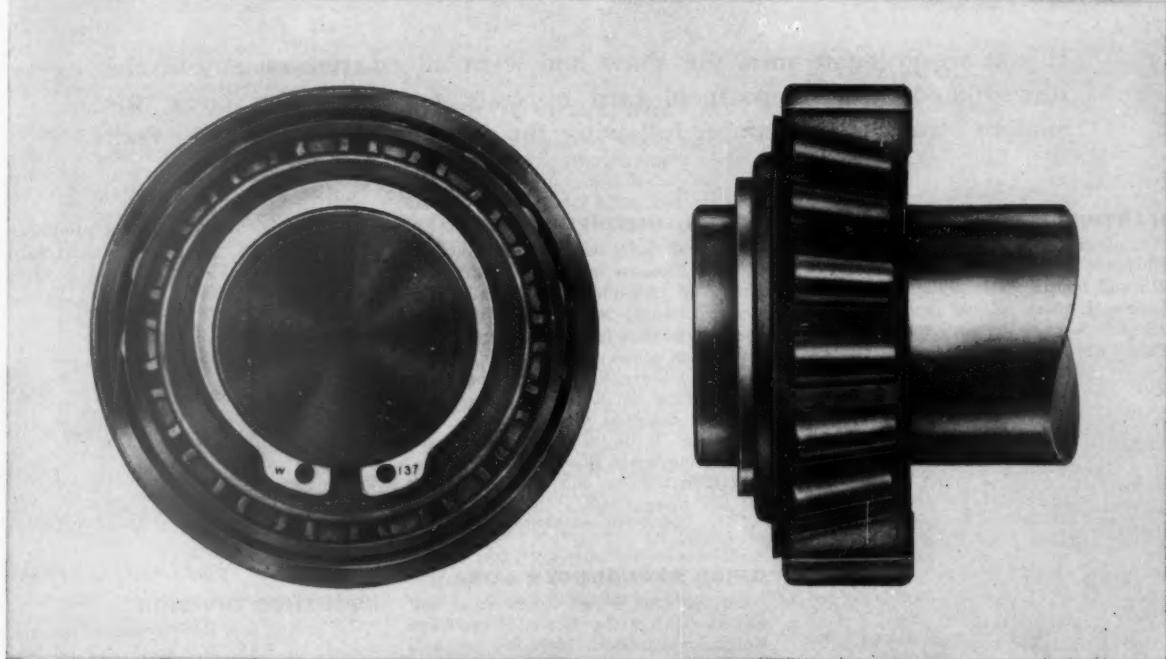
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"We identified that amnesia victim, chief. He designs memory devices!"

NEW! Waldes TRUARC Series 5160 Heavy-Duty Retaining Ring



**for thrust and impact...for retaining bearings
...for a new approach to heavy-duty fastening**

Now you can enjoy the benefits of a truly heavy-duty fastener — with all of the advantages and production economies retaining rings provide. The new Truarc Series 5160 is a unique external ring designed to secure components on shafts, axles and similar structural members. It has high thrust load and impact resistance and forms a shoulder sufficiently high to retain parts having large corner radii or chamfers. The Series 5160 is ideal for retaining bearings. You can use it *without spacer washers* to secure ball bearings, tapered roller bearings (shown above) and cylindrical roller bearings — all having large corner breakouts. The ring eliminates the need for machined shoulders, costly heavy-duty nuts

and other bulkier and more expensive fastening devices normally required for extreme loading conditions. The Truarc Series 5160 is available in 11 popular sizes for shafts ranging from .473" to 2.0" dia. — and other sizes are on the way. You can order the Series 5160 in carbon spring steel or — for corrosion resistance and high temperature limits — in Armco PH 15-7 Mo stainless steel. Sizes up to 1.378" also are available in beryllium copper. For complete specifications, write for Truarc Data Bulletin No. 459-11. Better yet, contact your local Truarc Representative or Distributor. They're listed in the Classified Telephone Directory under "Retaining Rings" or "Rings, Retaining."

SEE FOR YOURSELF — Send for a free sample of the Truarc Series 5160 Heavy-Duty ring. We'll include a standard external ring of the same size for comparison. You'll see the difference as soon as you open the envelope!

WALDES KOHINOOR, INC.

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May, 1961

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1961

See you in Detroit Cobo Hall DESIGN ENGINEERING SHOW

PRESSENTING SOME 15,000 IDEAS FOR NEW PRODUCTS OR NEW MODELS OF OLD PRODUCTS

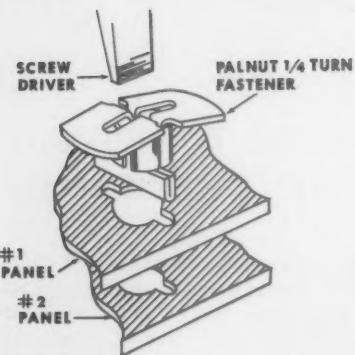
MAY 22-

If you are going to miss the show and want information on any of the items listed, use the postpaid card opposite page 58. Just circle the number matching the number following the description. We'll do the rest.

HARTWELL CORP.

Exhibiting for the first time, the Hartwell Company's exhibit in booth 915 will feature their Nylatch fastener, Lockwell quick-release pins, Gripwell chassis latch, Trigger-Action latch, Structural latch and Velcro.

Use postpaid card. Circle No. 1



PALNUT COMPANY

Among the new products shown by the Palnut Co. in Booth 115 will be a $\frac{1}{4}$ turn fastener. This tempered spring steel fastener is pushed into prepared holes in panels, then quickly assembled by inserting a screwdriver into the fastener slot, depressing the arched head and rotating 90° . The barrel shank keeps the fastener centered and adds shear resistance. A self retaining feature keeps the fastener in the outer panel when the assembly is disengaged. A complete line of the company's lock nuts, self-threading nuts and Pushnut fasteners will also be displayed. Palnut is a division of United Carr Fastener Corporation.

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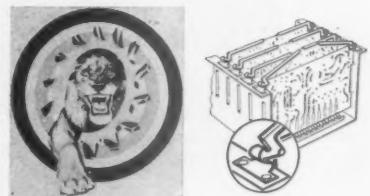
ROSAN, INCORPORATED

Featured in Rosan's booth 337, will be their Slimsert insert and their press nut. The one-piece, thin-wall high strength insert is corrosion resistant and is suitable for wide temperature range uses, made of standard materials. Special materials increase the high temperature range. The Rosan press nut was designed specifically for thin materials. It is of equal value for thicker materials. It is locked in torque, locked in tension, and contains a lock for the mating bolt.

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new line of standard stud mounting screws incorporating both left and right hand threads. The company is a division of Illinois Tool Works.

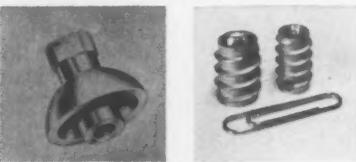
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GRIES REPRODUCER CORP.

On the spot design information will be available in Gries Reproducer Corporation's booth 1143. Set up as a small parts value analysis information center, the booth will feature displays illustrating the latest examples of improved small parts designs.

Use postpaid card. Circle No. 4



GROOV-PIN CORP.

A new high strength, low cost insert for wood will be one of the products featured by Groov-Pin in booth 1221.

The new WH series insert is suited for use in blind holes, as well as through holes and is made by die casting high strength Zamak.

Use postpaid card. Circle No. 5

SHAKEPROOF

Featured in the Shakeproof display, booth 844, will be the complete line of "Live Action" lock washers, including recent developments as the folded rim and flat rim dish washers. The company will also introduce data on a

SOUTHCO DIVISION

A spring and lever operated fastener made of SAE 1070 steel will be featured in Southco's booth 1021. Designed for rapid injection and ejection of printed circuit boards, the fastener supplies mechanical leverage to set up or break a circuit. Southco is a division of the South Chester Corp.

Use postpaid card. Circle No. 7

MINNESOTA MINING

On display in booth 550 will be the new Minnesota Mining & Manufacturing structural adhesives in film form and one- and two-part compounds. Also to be featured will be typical bonded structural parts illustrating how structural adhesives are used to solve design and assembly problems.

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JOHN HASSALL, INC.

Specializing in cold headings, John Hassall, Inc. will display in booth 927 examples of cold headed parts made to special order for manufacturers and assemblers.

Use postpaid card. Circle No. 9

LA SALLE STEEL

An electronic fact finder will be on hand in booth 563 to assist LaSalle personnel in answering questions about

cold-finished steel bar products. By selecting questions from a prepared list, visitors can get answers by simply pressing a button. An IBM sorter deposits the answer to the question asked in one of several sorter pockets. The visitor may ask as many questions as he wishes, and carry the printed answers away with him for future reference.

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AMERICAN SCREW CO.

In booth 835, the American Screw Co. will display their Screwstick, Torq-Set and Tri-Wing products. Torq-Set screws and bolts with a cruciform recess have wings radially located to deliver the highest driving torques that materials used for producing threaded fasteners are capable of withstanding. Available in diameters No. 2 through $\frac{1}{2}$ ", and in lengths up to six inches, the bolts are produced in carbon and high alloy steels, as well as the newer exotic metals, including titanium alloy, A-286 stainless steel, Greek Ascloy, and Inconel-X.

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BRISTOL COMPANY

The complete line of Bristol multiple-spline and hex socket screws in sizes from No. 0 and up with the latest design standards and specifications will be exhibited in booth 1036. Regular, as well as Bristol Nylon socket screws, including the 1960 series socket cap screws, socket set screws, flat head socket cap screws, and socket pipe plugs will be shown.

In addition, the Wrenchking open-end ratchet wrench will be demonstrated.

Use postpaid card. Circle No. 12

TUBULAR RIVET & STUD CO.

Visitors to booths 350-352 will be able to view Tubular Rivet's new Model 115A riveting machine. A heavy duty riveter which automatically feeds and sets $\frac{3}{8}$ " diameter tubular rivets. Also on display will be general display of standard and special rivets and various models of riveting machines.

Use postpaid card. Circle No. 13

PARKER-KALON

An improved hole drilling tapping screw that eliminates hole punching and drilling of light gage sheet metal will be one of the products exhibited by Parker-Kalon division of General American Transportation Corp. in booth 451. Called Tapits, the screw not only drills its own hole and forms its own thread, but has an integral washer with

a serrated face that acts as a built-in brake to minimize stripping and spinning.

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AIRMATIC VALVE, INC.

A pneumatically-operated, solenoid-actuated, positive-displacement metering pump that has an infinitely adjustable capacity from 0 to 6.44 cc, will be one of the products featured by Airmatic Valve, Inc. in their booth 1152.

Use postpaid card. Circle No. 15

EATON MANUFACTURING CO.

A new tamper-proof fastener, called Torqite, will be featured in Eaton Manufacturing Co.'s booths 656, 660 and 662. The special fastener's head has three equally spaced slots on its outer periphery. This feature makes it necessary to use a special tool for driving and conversely for loosening. Along with the special fastener, the Tensilock, Fastite, and Springtite fasteners will be displayed.

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AMERICAN HARDWARE

A new cup and drop handle that conforms to today's trend in flush-mount hardware and cabinet design will be one of the displays of the Corbin Cabinet Lock Division of American Hardware in their booths 1223 and 1225.

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SNAP-TITE, INC.

Among the products displayed in booth 1029, visitors will see featured Snap-Tite, Inc.'s series of rigid-line couplings.

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KAYDON ENGINEERING

Precision standard and special ball and roller bearings from 4" inside diameter to 178" outside diameter; needle bearings; needle rollers and thin section, large bore "off the shelf" bear-

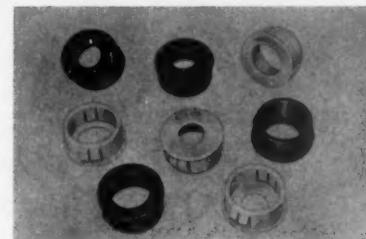
ings will be exhibited by Kaydon Engineering Corp. in booth 137.

Use postpaid card. Circle No. 19

HEYMAN MFG. CO.

The latest sizes and styles of nylon snap bushings, nylon hole plugs, nylon strain relief bushings and nylon junction terminal bushings will be displayed in Heyman's booth 218. The company will also demonstrate an air operated unit for assembly of Heyco strain relief bushings.

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AUTOMOTIVE RUBBER CO.

Examples of selective placement of sealants which can be applied to any shape or form will be part of Automotive Rubber Company's exhibit in booth 932. Also being displayed will be their plastisol grommets, gaskets, and form-dipped rubber parts.

Use postpaid card. Circle No. 21

ELASTIC STOP NUT

Greater tolerances for mating assemblies and simplified installation methods are offered to the users of Elastic Stop Nut Corp.'s floating clinch nut. These self-retained fasteners, will be featured in the company's booth 720.

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PANDUIT CORPORATION

A newly developed open-slot plastic wiring duct will be one of the products featured by the Panduit Corp., in their booth 1217. The new Type E duct re-



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tains all the original design features of the Type B Panduct. The improved design has rounded edges for the protection of wire insulation.

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SIMMONS FASTENER CORP.

The new Simmons Mini-Q-Lock will be shown in the company's booth 957. The quick opening fastener, a miniature version of the Quick-Lock, has been developed especially for miniaturized electronic applications, where space and weight limitations are important considerations.

Use postpaid card. Circle No. 24



AEROQUIP CORPORATION

Visitors to the peninsular booths, 619 and 718, will see Aeroquip's standard line of flexible hose assemblies, self-sealing couplings, clamps, straps, bands, load control and cargo tie-down equipment. Also available will be their new catalog, No. 250.

Use postpaid card. Circle No. 25

RUSSELL, BURDSALL & WARD

New fastener materials to be exhibited in RB&W booth 937 will include the aluminum alloys 2024-T4 and 6061, type 305 stainless steel, and silicon bronze. The latter will be shown in a wide range of sizes. Also on display will be special fasteners, sintered metal and custom molded thermo-plastic parts.

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LAMINATED SHIM CO., INC.

Laminated shims of titanium which will fulfill weight-saving and high tensile strength requirements for space-craft component assemblies will be featured by the Laminated Shim Co. in their booth 116.

Use postpaid card. Circle No. 27

RAMSEY CORPORATION

One of the products being featured in booth 1215 by the Ramsey Corp., is their Groove Guard. Use of the groove guard can increase the thrust capacity of a given retaining ring assembly by as much as two times.

Use postpaid card. Circle No. 28

STANDARD PRESSED STEEL

A self-aligning locknut which can develop the full rated strengths of bolts, even though the seating surface is as much as 8° out of perpendicular to the shaft, will be one of the high strength fasteners displayed by Standard Pressed Steel Co. in their booth 815.

Use postpaid card. Circle No. 29

BUCHANAN ELECTRIC PROD.

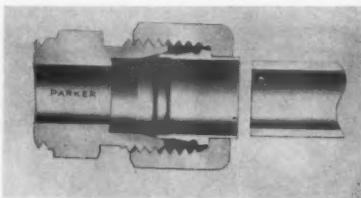
Among the electrical connectors and tools featured by the Buchanan Electric Products Corp., in their booths 720-726, will be a portable pneumatic crimping tool. The tool is used for crimping removable pin and socket contacts used in electrical connectors. It produces a crimp equivalent to a Class 1 configuration of MIL-T-22520.

Use postpaid card. Circle No. 30

PARKER-HANNIFIN CO.

A modification made in the Intralok "bite" type tube fitting involves the ferrule and nut. By elongation of the ferrule and dimpling of it, it has become a snap-in ferrule, held captive by the nut. The captive feature of the ferrule makes it in effect a two piece fitting. The modified Intralok fitting, as well as other products of the Parker-Hannifin Co. will be on display at booth 544.

Use postpaid card. Circle No. 31



FERRY CAP & SET SCREW

The Ferry Cap & Set Screw Co. will feature the Ferry Cap Counter-Bore screw in their booth 809. This new fastener is an externally wrenchable screw used in standard counterbored holes with standard wrenches. A complete line of the company's other products will also be on display.

Use postpaid card. Circle No. 32

H. B. FULLER CO.

The H. B. Fuller Co. display unit will feature specific applications of epoxy products in their booth 1129. Various assemblies using adhesives, plastic alloys, sealants and coatings will be shown. A variety of applications will also be included.

Use postpaid card. Circle No. 33

MOELLER MFG. CO.

On display at Moeller's booth 1257, will be special closures which have been developed by the company for applications in many fields. The Snap-



the new symbol of progress...

... with the background of time tested experience

For almost two decades we have been creating talented fasteners to solve the problems of modern industry. This creative ability didn't just happen — it was developed over many years of probing into your production problems in a never ending search for a better way. One question is foremost in all our development work — "How can we do it better with less cost to you?" Seeking the answer to this continuing question is our surety of progress. Look for the GLS symbol — it is your assurance of the latest in creative products — and your guarantee of finest quality.



**GREAT LAKES
SCREW CORPORATION**

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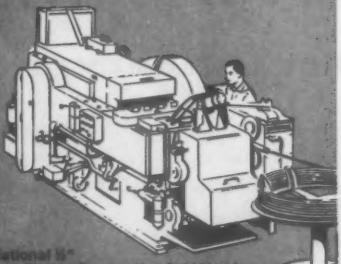
still more parts from wire!



These important parts are cold-formed from coiled wire, start to finish in compact, efficient National Cold Headers.

These parts are formed practically scrapless. All achieve remarkable savings over past methods.

If you make odd-shaped parts, may we help you evaluate them for cold-forming from wire? Better yet, come to Tiffin, witness our demonstrations and let's discuss your work.



NATIONAL MACHINERY CO.
TIFIN, OHIO U.S.A.
HARTFORD DETROIT CHICAGO

Use postpaid card. Circle No. 227

Tite and Turn-Tite stoppers were developed originally for sealing odd-shaped holes in castings during processing and machining.

Use postpaid card. Circle No. 34

LAMSON & SESSIONS CO.

Hook Knurl bolts will be one of the products featured by Lamson & Sessions in their booth 140. The Knurl bolts permit easier and more economical assembly since the bolt head does not have to be held while assembling. It can be used with lock nuts and provides a better electrical grounding.

Use postpaid card. Circle No. 35

CARR FASTENER

Shown for the first time, the Carr Fastener's Dot washer nut will be featured in their booth 1242. The company is a division of United-Carr Fastener Corp.

Use postpaid card. Circle No. 36



ROBIN PRODUCTS CO.

To be featured in Robin Products' booth 103, is their new "sunburst" plastic fastener. Excellent where corrosion resistance is a problem, this fastener embodies a mechanical locking feature and can be easily installed with a simple hand tool. The plastic fastener is particularly suited to electrical components use because of its insulating properties.

Use postpaid card. Circle No. 37

ETC INCORPORATED

Electrical terminals and connectors will be displayed by ETC in their booth 1157. Featured this year are two new lines; large terminals and connectors and heavy duty terminals.

Use postpaid card. Circle No. 38

DZUS FASTENER CO.

Two new products will be shown in the Dzus Fastener Company's booth 428. One is the high strength fastener with a new buttress thread, the other is the company's CL-1 clamp which is used to secure and protect the sensitive elements enclosed in tubing used with fire detection equipment. In addition, the company's complete line of standard fasteners, special fasteners for use in the missile and aircraft industries, as well as their quick fastening panel fastener will be shown.

Use postpaid card. Circle No. 39

NATIONAL STANDARD CO.

New wire materials, the Rene' 41, Alstan, chrome vanadium and chrome silicon wire, will be featured in Na-

tional Standard's booth 801. In addition, other metal products and wires made by the company will be exhibited.

Use postpaid card. Circle No. 40

ALUMINUM CO. OF AMERICA

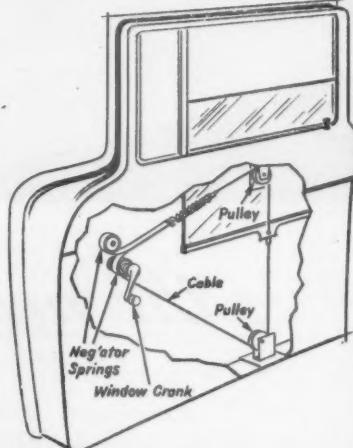
Alcoa's display in booth 721 will be almost entirely devoted to the appearance, design, styling, and functional uses of aluminum products. Among the features of the display will be the first general showing of Vynalite, a vinyl-clad aluminum sheet.

Use postpaid card. Circle No. 41

WALL COLMONOY

Brazing alloys in a new form will be the feature of Wall Colmonoy's exhibit in booth 1234. The alloys will be displayed as a unique mixture of powder in a high viscosity vehicle. Syringe and air-gun application of the new brazing alloy form will be demonstrated during the show by personnel of the company.

Use postpaid card. Circle No. 42



HUNTER SPRING

Automotive applications of the Negator constant force spring and constant torque spring motor will be featured in Hunter Spring's booth 863. The company will also introduce its new Push-Pull Force Gage for in-line measurement of tension and compression loads.

Use postpaid card. Circle No. 43

SEALED for SECURITY



LEE PLUGS seal sensitive hydraulic transmission components that help guide U. S. Army Hawk Missiles produced by



"Reliability." That's the key word in Raytheon's important program of manufacture of highest standard missile components. There's no room for failure *at the top!*

That's the reason Raytheon uses Lee Plugs of numerous sizes in a variety of hydraulically ported components in the HAWK missile. Typical is the "gimbal block" in which 12 Lee Plugs are used to effectively seal potential trouble spots in the lightweight magnesium alloy. This block is tested under pressures of 2000 psi (working pressure) and 4000 psi to insure against leakage. According to Raytheon, "by simplifying installation yet performing the job effectively, Lee Plugs have contributed reliability and a reduction in manufacturing costs."

Find out how Lee Plugs can contribute to the success of your products ...

Write today for complete engineering data

LEE COMPANY
OLD SAYBROOK, CONNECTICUT

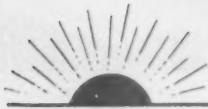




COLD-HEADED SPECIAL PARTS

FOR TOMORROW

Every Tomorrow brings new demands, new concepts, new developments, new products to ever-growing markets. Designers are daily delivering new ideas to production people — each requiring new special parts, new component assemblies, new fasteners.



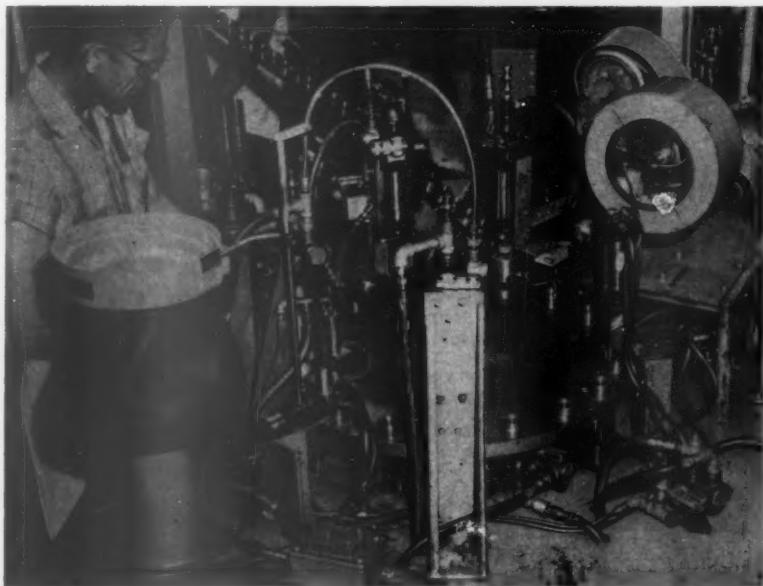
With every dawn, Elco puts into production some result of a designer's new idea, some satisfaction of a buyer's requirement, some engineer's solution of a pressing problem. Are any of yours among them? *Buy Elco and You buy the best!*

ELCO SCREW CORPORATION
1101 SAWILLSON ROAD, ROCKFORD, ILLINOIS

In manhattan at the coliseum... may 22-26

TOOL EXPOSITION & CONFERENCE

If you are going to miss the ASTME show and want information on assembly equipment listed, use the postpaid card opposite page 58.



(See No. 45)

BELLOWS-VALVAIR

Bellows-Valvair, Division of IBEC, will exhibit a complete product line in booth 2517, which will include air control valves, air motors, rotary feed and index tables, drill press feeds, grinder feeds, and drill units. Also "Spot-A-Mation" displays of Bellows-Valvair equipment in operation as typical cost saving applications for a variety of production procedures will be featured.

Use postpaid card. Circle No. 45

FERGUSON MACHINE CO.

Ferguson Machine Co., will exhibit newly developed machine drives, cam indexed roll feeds, and a standard assembly machine tool feeding and placing parts in its exhibit in booth 2402.

The cam index roll feeds featured are ones which will attain speeds up to 700 strokes a minute.

Also to be featured is an assembly machine which embodies machine tool principles to facilitate rapid change-over for new production runs.

Use postpaid card. Circle No. 46

SYLVANIA LIGHTING PROD.

Featuring units designed for automatic assembly of small parts, Sylvania Lighting Products will display in their booth 3921, different sizes of their rotary indexing and in-line transfer units for use in automatic assemblies.

Use postpaid card. Circle No. 47

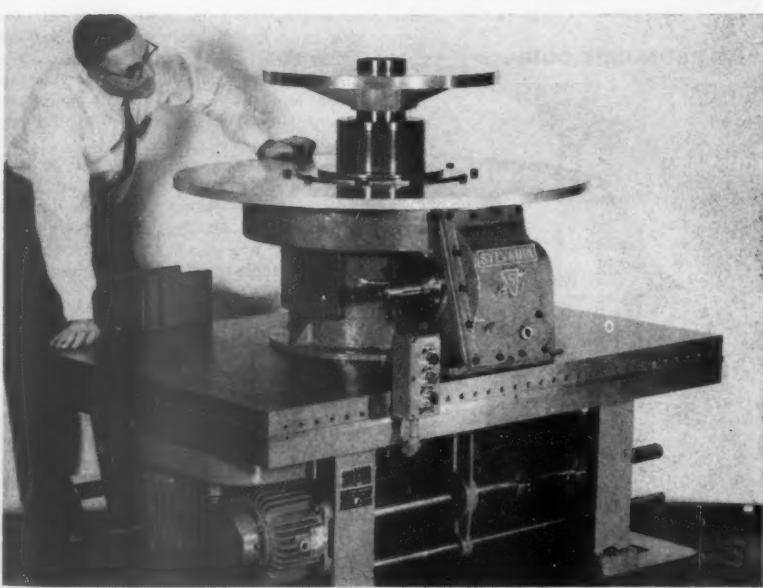
WALES-STIPPIT

The new Strippit BN series addition to the line of self-contained hole punching units, will be one of the items featured by Wales-Strippit, Inc. in their booth 1035. In addition to the BN series, a complete line of hole punching and notching units, and sheet metal machinery and accessories will be featured.

Use postpaid card. Circle No. 48

WILTON TOOL MFG. CO.

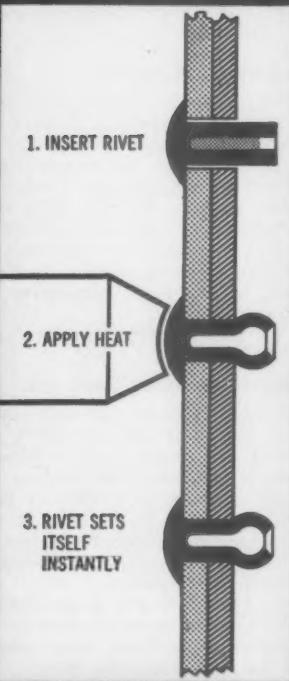
A complete line of over 400 power and manual clamping tools will be displayed by Wilton in their booth 3838. Highlighting the display will be the



(See No. 47)

NEW DU PONT EXPANSION BLIND RIVETS

...safe, simple, economical



- One unskilled operator can set up to 25 per minute...in blind applications.
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company's new Midget PowRlock, a power clamping tool for securing small electric and electronic parts, control mechanisms and missile parts.

Use postpaid card. Circle No. 49

ACF ELECTRONICS



Visitors to booth 1623, will find featured ACF Electronics Division's portable punch riveter. The unit is said to operate 11 times as fast as existing methods. The unit is the Division's new product in its line of ERCO machine tools.

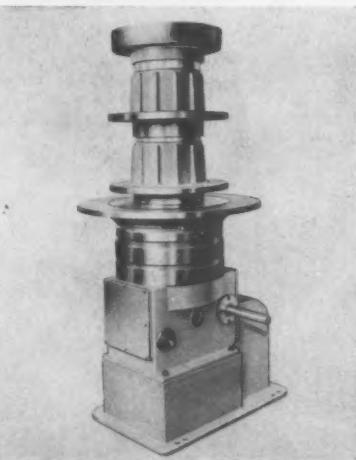
Use postpaid card. Circle No. 50

STANLEY POWER TOOLS

Following its recently announced entry into the air powered tool field, Stanley Power Tools will feature their line of "Unishear" air metal cutting shears and air powered motors and routers, both for standard and specialized high-speed production work. Stanley's booth is 3830.

Use postpaid card. Circle No. 51

SWANSON-ERIE CORP.



A new model SD turret indexing machine chassis with double overhead tool plates for mounting and actuating

operational tooling will be displayed for the first time in the Swanson-Erie Corp. booth 2534.

Developed for high-speed, high-volume operations, the chassis employs the dual-motion method of multiple-piece part assembly. It is available in a wide range of turret diameters, index positions and work cycles, and is suited to relatively light sequential machining, assembling and processing operation.

Use postpaid card. Circle No. 52

WINSLOW PRODUCT ENGRG.

A new drill pointer, Model 100-C, with an automatic hopper feed will be shown for the first time at Winslow Product Engineering Corp.'s booth 1240. The unit is said to be extremely fast, and has a production rate of up to 1500 drills per hour.

Use postpaid card. Circle No. 53

BRISTOL COMPANY



A gun-type automatic feeder-driver for headless socket set screws will be demonstrated in Bristol's booth 3318. The compact machine (requiring bench area less than 13" by 21") feeds set screws at a rate up to 2000 production units an hour.

Screws are magazine-fed to the selector-indexing mechanism, and carried by air pressure through a flexible tube to the driving gun which seats them to preset depth or torque. A clutch mechanism prevents overtightening.

Use postpaid card. Circle No. 54

EDWARD SEGAL

A new concept in eyeletting equipment for producing reliable connections in circuitry board will be featured in Edward Segal's booth 3229. The equipment feeds, sets and resistance-fuses eyelets as small as .020" inside diameter to boards as thin as 1/64".

Also exhibited by Segal will be a cam-operated rotary index table adaptable to such operations as tapping, staking, clamping, inspection, etc.

Use postpaid card. Circle No. 55

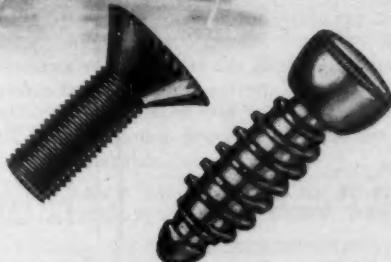


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IT**



Got a question, challenge, puzzle
to share or story to tell? Shoot it
along, we'd like to meet you.

COMMUNICATIONS IN MISSILEVILLE

According to Murray Moler of UPI, missile-men at Cape Canaveral, don't speak the English language.

One of the rules of Canavarese are:
Never take a direct approach when an oblique attack can be used.

Saying that a missile has a duplicate electronic system, in case one fails in flight is out. It's "The bird has a capability of redundancy."

It's against the over-all concept to speak of a delay in the firing sequence. Instead it's "There's a hold in the count down."

If the technical foul-up can never be explained, don't bother. Just whisper that there's a "malfunction at the junction."

Everyone who is anyone in Missileville will understand.

WATCH THAT AUTOMATED SYNTAX

Commenting on the use of automation techniques in the book publishing field, a member of the industry compared the process to "starting with a few nuts and bolts on one end and finishing with a completed automobile." And we have read some literary vehicles lately that seem to have been started with the same components.

ENGINEER OF THE YEAR

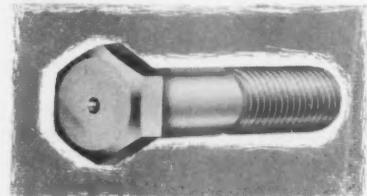
Our nomination for the "Engineer of the Year" award goes to a Blackstone, Mass., husband and wife team, the proud parents of four children, ages 4, 3, 2, and 1 year. They have simplified the problem of birthday parties and cakes by providing their children with the same birth date, February 17.

MATH OVER LIGHTLY

The hour and minute hand of my watch, coincides with those of your watch, every 65 minutes exactly. (A) How inaccurate is your watch? (B) In how many hours will your watch gain or lose an hour? (answer on page 76).

The Rochester Indicator—

SELF-LOCKING MACHINE BOLT



Now that Alaska has joined us as our 49th State, engineers at the DuMont Industrial Screw Corp., felt she deserved some special consideration. Without much thought, or hesitation, they have designed this self-locking machine bolt to be used exclusively above the Arctic Circle. The bolt is made with a hollow shank, and a small opening in the machine head. The obvious application is that after inserting the bolt in the normal manner, the shank is filled with water through the hole in the head. Upon freezing, the bolt expands, locking it securely in position. To remove, simply heat and turn out.

TECHNOLOGY ON THE MARCH

We understand the reason some of the boys in various R&D departments are so quiet is that they are working on a waterproof toast to be used under poached eggs.

DEFINITION

Top Management Material—Someone who can look businesslike when leaving the office to play golf.

LIMERICK CORNER

Japanese now distilling Scotch—news item. News has spread from Seoul to Karachi, The Japanese now make Scotch, as well as Sake, With pot still and barley and peat, And labels, printed so neat. They've marketed a brand called "Auld Hibachi".

"Most of the fun lies in those who don't know how to live the bellies."

ROCKFORD

HOME WORKSHOP
PROJECT of the
MONTH



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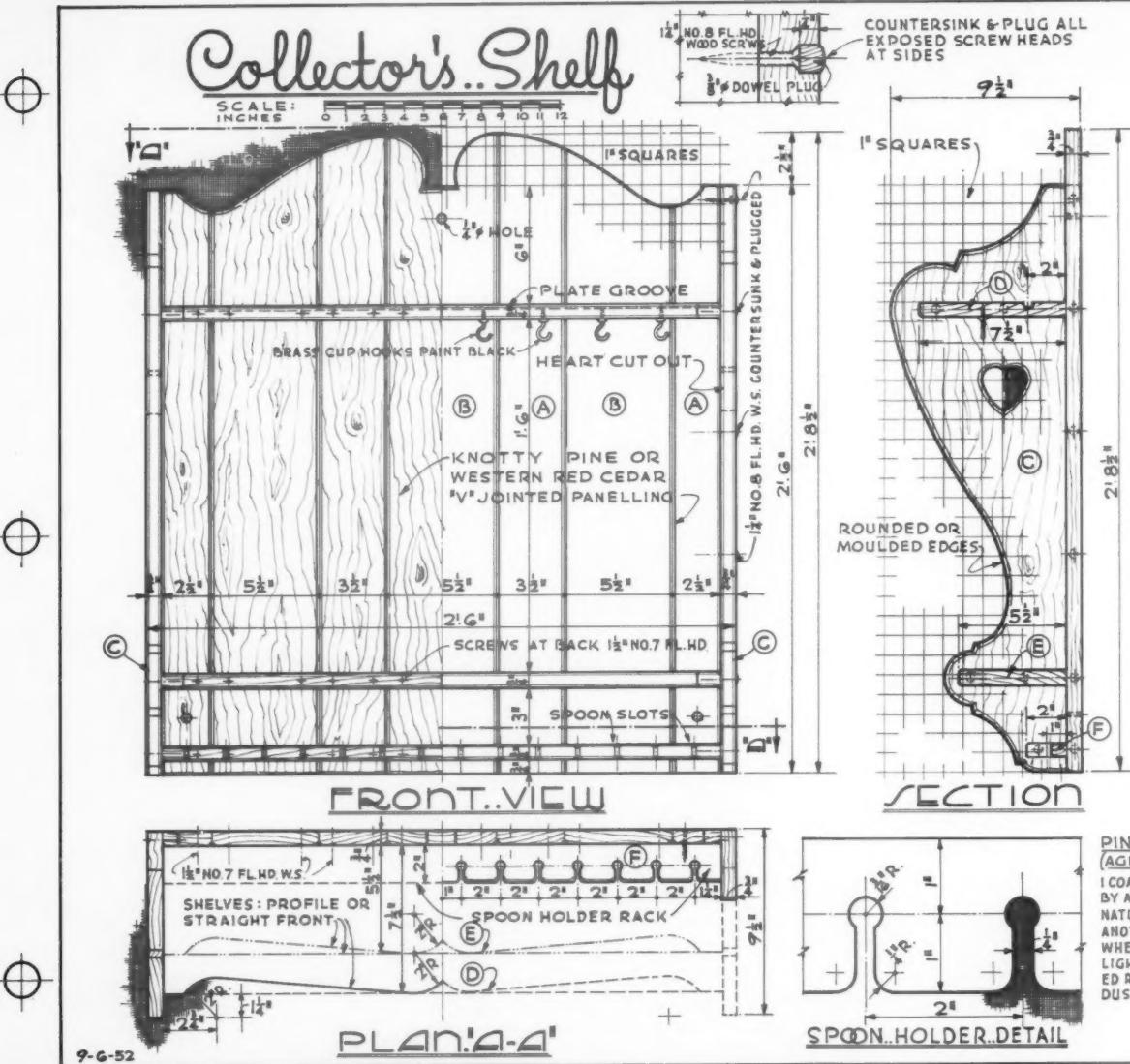


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HOME WORKSHOP
PROJECT of the
MONTH



INSTRUCTION

- WE ARE TOLD, EVERYBODY HAS A HOBBY TO KEEP OUR MINDS AND HANDS BUSY, THUS I CHECK. COLLECTING OLD THINGS IS AN INTERESTING HOBBY.
- MOM HAS SOME OLD SEASHELLS AND KNICK-KNACKS THAT I FOUND IN GRANDMA STASHED AWAY IN A BOX. NO PLACE TO SHOW THEM OFF.
- LET'S SURPRISE HER BY BUILDING A COLLECTOR'S SHELF I DESIGNED IN THE TRADITION. IT'S EASY TO BUILD FROM KNOTTY PINE OR RED CEDAR & FINISHED IN A DAY.
- IF YOU ARE EQUIPPED WITH A SAW, MOULDING IRON, AND A SMOOTHING PLANE, REFINEMENT TO THE FINISH IS EASY. SIMPLY MAKE FRONTS STRAIGHT, EDGES SLIGHTLY IRREGULAR, AND AN OLD WORN APPEARANCE.
- USE THOSE RELIABLE ROCKFORD SCREWS COUNTERSUNK & PLUGGED.
- "V" JOINTED BOARD BACKS GIVE ADDED CHARM. IF YOU DON'T HAVE A JOINTER, LET ME KNOW & I WILL SEND YOU MATCHING PIECES. GOOD LUCK.

BILL OF MATERIALS	
4 PCS.	3/4" x 3 1/2" x 32 1/4" BACK
3	3/4" x 5 1/2" x 32 1/4" BACK
2	3/4" x 9 1/2" x 30" ENDS
1	3/4" x 7 1/2" x 26 1/2" SHELFS
1	3/4" x 5 1/2" x 26 1/2" SHELFS
1	3/4" x 2" x 26 1/2" SHELFS
1	3/8" x 12" DOWEL
8	3/4" BRASS CUP HOOKS

PINE FINISH:
(AGED DUSTY EFFECT)
1 COAT GRAY STAIN FOLLOWED BY A WHITE SHELLAC WASH.. NATURAL OR LIGHT OAK FILLER. ANOTHER COAT OF WHITE SHELLAC. WHEN DRY STEEL WOOL OR SAND LIGHTLY AND WAX. ADD POWDERED ROTTENSTONE TO WAX FOR A DUSTY AGED EFFECT.

SCREW
PRODUCTS
USE FOR CRAFT PURPOSES ONLY

CTIONS.

LD, EVERYBODY SHOULD HAVE
EEP OUR MINDS OCCUPIED &
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OME OLD SENTIMENTAL DISHES
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EASY TO BUILD IN KNOTTY-PINE
FINISHED: DUSTY ANTIQUE TOO.
QUIPPED WITH PROPER TOOLS,
ES & PROFILE SHELF FRONTS ADD
O THE FINISHED PIECE.. OTHER-
FRONTS STRAIGHT & ROUND ALL
LY IRREGULAR TO GIVE THEM
APPEARANCE.

E RELIABLE "ROCKFORD" WOOD
TERSUNK & PLUGGED AS DETAILED
BOARD BACK & HEART CUT-OUT
HARM. IF YOU LIKE PROJECT NO.
W & I WILL ADD A FEW INTERESTING
ECES. GOOD COLLECTING.

Let's have your comments
TERM.

MATERIALS

32½"	BACK "A"	"ROCKFORD" FLAT HEAD WOOD SCR'S
32½"	ENDS "C"	
30 "	SHELD "D"	3 DOZ. 1½" NO. 7
26½"	" E "	
26½"	" F "	2 • 1¼" NO. 8
DOWEL		
S CUP HODDS		3-2" NO. 8 QD. HEAD

Hobby-neering®

SERIES.. NO.11

PROJECT
2

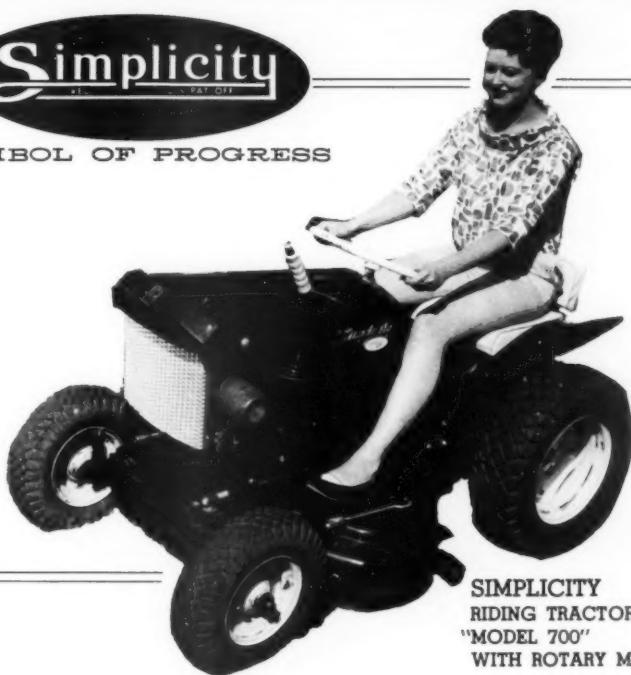
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- SNOW PLOW & BULLDOZER
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- LAWN ROLLER
- FERTILIZER & SEEDER
- LAWN AERATOR & ROTARY TILLERS

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The
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#12c Deluxe in Chrome
with Plastic Tray

Manufactured by:

HARVEEN Metal Products, Inc.

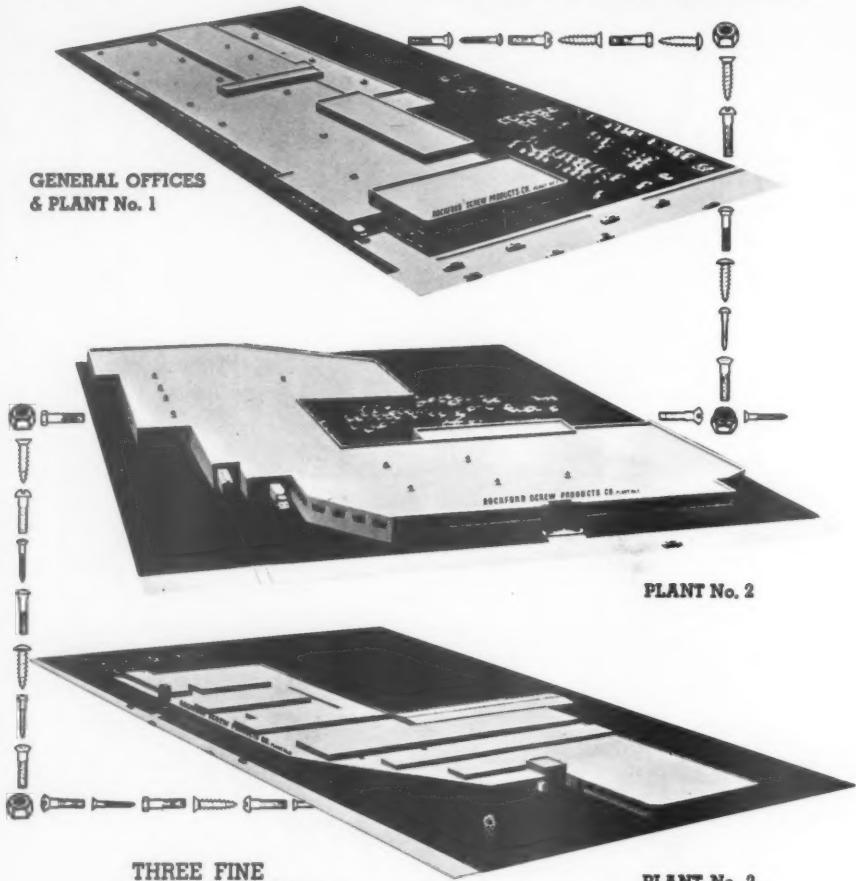
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- II What Management Can Do About Cost Reduction
- III Cost Reduction Co-ordinator
- IV Cost Reduction Specialist
- V Developing the Cost Reduction Program
- VI Waste Prevention
- VII Operations Analysis
- VIII Promoting the Cost Reduction Program

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- Exhibit B Cost Reduction Committed Minutes
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- Exhibit D How And Where To Cut Waste
- Exhibit E Waste Which Foremen Can Prevent
- Exhibit F Cost Reduction Idea, "MT" Day
- Exhibit G Principal Tools Of Work Simplification
- Exhibit H Package Planning Check List
- Exhibit I Adams Computer Characteristics Chart



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management

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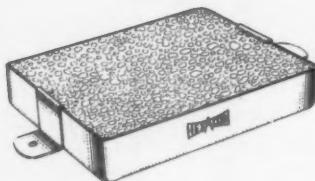
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May, 1

WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 58. Just circle the number on the card matching the number following the description. We'll do the rest.



See No. 60

SOLDERING TIP CLEANING SPONGE

A soldering tip cleaning sponge saves time and extends soldering iron tip life.

It eliminates tip wear caused by use of abrasives and contamination caused by use of wiping rags. The sponge cleans while tip is hot, without removing protective solder. Fine porosity makes it ideal for cleaning small diameter tips. The sponge is large enough for all tips.

An aluminum tray contains an adequate water supply, keeping the sponge wet at all times.

Hexacon Electric Co., 635 W. Clay Ave., Roselle Park, N.J.
Use postpaid card. Circle No. 60

BENCH CLAMP IMPROVES ASSEMBLY OPERATIONS

A 5½" high PowRarm, designed to make low bench operations easier and less fatiguing is 3" shorter than the standard unit and holds a workload of 50 lbs.

The base dimension, the size of the swivel ball, and the mounting dimensions all remain the same as the standard model 301.

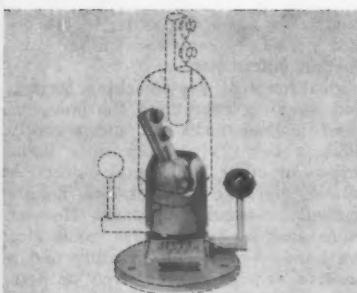
Wilton Tool Mfg. Co., Inc., 9525 Irving Park Rd., Schiller Park, Ill.
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PNEUMATIC WIRE CLIPPERS SPEED ASSEMBLY

Wire clippers specifically designed for production wire trimming are pneumatically powered.

The Air-Nips, require twenty-eight times less pressure to operate than conventional hand pliers. They weigh a scant six ounces, and will cut through soldered portions of 14 ga. copper wire cleanly.

Requiring less operating pressure, operator fatigue is lessened, in such high rate assembly and production runs as clipping electric motor armature leads.



See No. 61



See No. 62

Another feature of the pneumatically operated clippers is a pointed cutting head that can be rotated 180° to enable the operator to get at hard to reach leads.

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N.Y.
Use postpaid card. Circle No. 62

HAND TOOLS FLAME CUT TO CUSTOMERS SPECS

Special wrenches and similar hand tools are available to custom designs and specifications.

The tools are flame-cut by a natural-gas and oxygen process which provides close tolerances and a fine surface finish.

Any jaw configuration can be flame-cut. As cut, the jaws are smooth and accurate; wrenches may frequently be placed directly into service with no machining. The tools can be furnished with the flat sides ground smooth, also.

The Reliable Steel Plate Co., 2330 E. 79th St., Cleveland 4, Ohio.
Use postpaid card. Circle No. 63

COMBINATION WRENCH SET HAS WIDE SIZE RANGE

Containing a wide size range of combination wrenches for use in heavy industry, set No. 1200-A consists of 26 wrenches with openings from ¼" through 2". Each wrench is locked into position in the heavy-duty steel box, yet quickly removed for use.

The wrench heads are designed for clearance with maximum strength. Heavy chrome plate withstands weather.

Proto Tool Co., 2209 Santa Fe Ave., Los Angeles 54, Calif.
Use postpaid card. Circle No. 64

JACKNIFE HEX KEY SET SAVES TIME

A precision-made hex wrench set cuts downtime spent looking for individual hex keys.

Called the Fold Uni Key, it is avail-

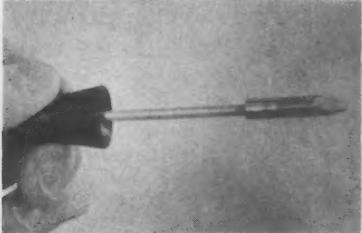
able in three models, fits all types of hex socket set screws from No. 5 to $\frac{3}{4}$ -inch. Each hex key opens and closes like a jackknife blade and automatically snaps into right angle position for greater leverage or extends straight out like a screwdriver. The unused keys remain in the handle to give user added leverage.

All wrenches are made of the chrome nickel steel scientifically hardened and tempered for extended durability. Sets come in three sizes.

Eklind Tool & Mfg. Co., 2627 N. Western Ave., Chicago 47, Ill.

Use postpaid card. Circle No. 65

MIDGET SOLDERING IRONS HAVE IMPROVED DESIGN



Midget soldering irons with improved performance, have a new handle design and redesigned tip and heater assembly.

With a new clip arrangement, the tip and heater assemblies can be changed

AUDIO-VISUAL UNIT FOR INTRICATE ASSEMBLY WORK



A new audio-visual instruction unit, called Teleguide, is designed to permit individual workers to completely assemble either electronic, electrical or mechanical products. The unit recently helped cut assembly time 50% on a missile component, even though the worker was already acquainted with the assembly procedure.

The unit is composed of a 35 mm projector for color slides, a rear-view

faster and easier than with previous GE models. The entire assembly can now be pulled out of the handle, the tip and heater assembly slipped out, a new one put in and the assembly pushed back into the handle.

Designed for increased operator comfort, the redesigned handle will not heat up.

General Electric Co., Schenectady 5, New York.

Use postpaid card. Circle No. 66

TORQUE REELS FOR SPECIALIZED APPLICATIONS



Small, compact and light in weight, the "F" Series torque reels are available in three sizes. They can be used for suspending and balancing five, ten or fifteen pound units such as metal strapping tools, powered staplers, portable air and electric tools.

A patented instant automatic release lock immediately engages at any de-

sired cable length, relieving spring tension for freedom of unit movement. Less than one-half inch pull, instantly releases lock, and cable retracts to rest position.

External spring tension adjustment provides for a perfect balance setting for weights within the rated capacity.

Aero-Motive Mfg. Co., 1803 Alcott St., Kalamazoo, Mich.

Use postpaid card. Circle No. 67

SMALL HAND MAGNET AIDS PARTS HANDLING



A manually-operated magnetic unit for handling small or large metal parts can also be used for feeding round, square, or irregularly-shaped sheets into presses, shears and similar production equipment.

Ideal for small parts packing, sorting, and weighing operations, the powerful hand magnet picks up and securely holds a quantity of loose nuts, bolts, screws or other light metal objects. A squeeze on the plunger-like handle instantly releases the parts. Heavier items such as blocks, dies, rods, etc., are handled with equal facility and a positive grip is assured even on wet, greasy, sharp, or hot metal objects.

Magnetic Products Division, Jess Corp., 15770 Telegraph Rd., Detroit 39, Michigan.

Use postpaid card. Circle No. 68

TOOL CUTS SHEATHING OF RUBBER COVERED CABLE



Ring cutting of inside type plastic fabric or rubber covered cable is now possible with the N-2060 cable tool.

The cable is pushed into the tool and against the spring. Back pressure holds the cable against the cutting blade.

An accurate .03125" deep cut is made when the tool is rotated around the circumference of the cable.

The tool is suited for the customary inside type cable from 3/16" to 1/2", and it will handle thin sheathed cable

LaBelle Industries, Inc., 550 So. Worthington St., Oconomowoc, Wis.

Use postpaid card. Circle No. 69

12

NEW GRINDERS

in a power range
all their own!



features

- **Sensitive Weight-Type Governor**—prevents overspeeding, assures positive, accurate speed control.
- **Improved Muffling**—15 decibels quieter than comparable tools.
- **Built-In Lubricator**—automatic motor lubrication increases tool life.
- **Built-In Air Strainer**—protects motor.
- **Rubber-Faced Throttle Valve**—unaffected by moisture, dirt and rust.

*Ask your AIRengineer for a convincing on-the-spot demonstration of how these new grinders—as well as all other Ingersoll-Rand air tools—can earn an Annual Dividend on your Payroll Dollars.

Now! You can choose the abrasive tools that best fit your needs from 138 sizes and types of Ingersoll-Rand Grinders.

New Series 15 Grinders

- Speed—6000, 9000, 12000 and 15000 rpm
- Weight—6½ lbs.
- Length—16½ ins.
- Grip or straight handles with lever or thumb throttles

Twelve new Ingersoll-Rand grinders in a completely new size and power range! These small, high-performance grinders are specifically designed to fill the need for light weight, easy-handling tools that will hold their speed under load on a wide variety of difficult grinding and buffing jobs.

Series 15 Grinders fill the bill—and offer manufacturers important new proof of tools to increase Annual Dividends on Payroll Dollars.*

215A-8



Ingersoll-Rand

11 Broadway, New York 4, N. Y.

Planned Annual Retooling
increases output per man

Use postpaid card. Circle No. 231

up to 1" in diameter. The cuts are 1/32" deep in each instance.

P. K. Neuses, Inc., 511 N. Dwyer St., Arlington Heights, Ill.

Use postpaid card. Circle No. 70

HIGH SPEED NUT TAPPER IS FULLY AUTOMATIC



A high speed, fully automatic multi-spindle nut tapping machine operates by the over-run boring principle.

However, the nut holding device consists of a reciprocating member which in its rearward position receives the nut blank as it is fed from a hopper. It then locks the blank against rotation during its forward movement.

Except for its rotation, the boring spindle does not move. The nut holder, by its reciprocating movement carries

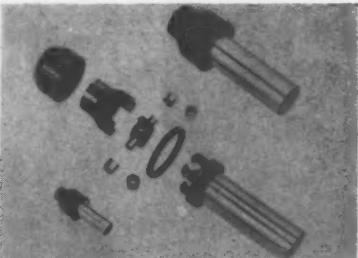
out all the steps of receiving, locking and feeding the nut over the threading tool.

The operation and the control of the machine is adaptable to various types of nuts.

Pan American Supply Co., 42-15 Crescent St., Long Island City 1, N.Y.

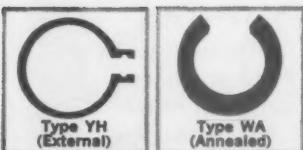
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FLOATING TOOL HOLDER FITS STANDARD UNITS



A floating tool holder is now available for use on single-spindle and multiple-spindle screw machines and turret lathes. It compensates for the inaccuracies of misalignment from spindles to workpiece.

Known as the Aline-X floating tool holder, the device is made in shank sizes from $\frac{1}{8}$ -inch through $1\frac{1}{2}$ -inch to fit any standard single or multiple-spindle screw machine or turret lathe.



...Improve Product Quality!
...Lower Production Costs!

NATIONAL RETAINING RINGS

Call or write
for catalog
or ask for
recommendations
on specific applications

Eliminate machining time and material waste resulting from cutting down shafts and housings to form shoulders. Using smaller shafts, grooved to accommodate economical NATIONAL Retaining Rings, accomplishes important cost reductions, speeds-up production, actually improves the product. Proven applications range from heavy duty machinery to small tools, electronic instruments and toys.



The NATIONAL
LOCK WASHER COMPANY
MILWAUKEE 2, WISCONSIN
NEWARK 5, NEW JERSEY

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Serving
Industry
Since 1886

The tool holder has only nine parts and a single, accurate adjustment point. Its design also prevents chatter and vibration.

Allied Metal Products, Inc., 1082 Farmington Ave., Kensington, Conn.

Use postpaid card. Circle No. 72

SELF-INDEXING STORAGE RACK FOR DRILL RODS

A self-indexing storage rack for drill rods provides easy selection of any size, and at the same time it is an automatic visual inventory of stock.

Racks can be mounted on the wall and have an over-all size of 46" x 30".

Two models are offered. Model N is indexed No. 1 to No. 60 with decimal equivalents. Model F is indexed from $1\frac{1}{32}$ " through $17\frac{1}{32}$ " in $1\frac{1}{64}$ " increments.

Industrial Tool Works, 3541 Martens St., Franklin Park, Ill.

Use postpaid card. Circle No. 73

TOTE BOXES OFFER DUST & MOISTURE-FREE STORAGE



Tote boxes for dust and moisture-free storage and handling are available for two parent box sizes with the same length and width, but different depths.

Inner boxes fit in the parent boxes in a great variety of combinations. Parent boxes of different sizes, carrying inner boxes, stack interchangeably.

Topline modular boxes, model 538, are molded by heat and pressure from a combination of polyester resin and fiber glass. The inert material resists chemical corrosion and the smooth surface can be cleaned by hot water, steam or detergents. Permanent colors can be molded into the boxes.

Molded Fiber Glass Tray Co., U.S. Route 6, E. Linesville, Pa.

Use postpaid card. Circle No. 74

VISUAL CONTROL BOARD AIDS PRODUCTION SCHEDULING



A compact model of the larger Rol-a-charts consists of a stationary index and an endless, transparent, plastic

sleeve that moves across a fixed grid.

Entries are made on the Rol-a-chart Jr. with a marking pencil. As the plastic sleeve is turned ahead, each day or week, all schedules automatically move up, so that no deadlines or deliveries can be overlooked.

The chart has index space for 40 vertical entries. The plastic sleeve provides space for 154 quarter inch spaces horizontally.

Conley, Baltzer & Steward, Rol-a-chart Division, 494 Jefferson St., San Francisco 9, Calif.

Use postpaid card. Circle No. 75

POSITIVE TORQUE SETTINGS FOR AIR DRIVEN TOOLS



A single-action clutch with positive torque adjustment for air-driven screwdrivers and nutsetters is designed expressly for jobs where torque settings must be held to unusually close limits through any number of cycles.

Torque is preset, and when the threaded fastener reaches the preset torque limit, two cams on the Torqmatic clutch open instantly. A separate lockout cam confirms the action by thrusting out three lock pins to keep the clutch disengaged until pressure on the work is released, when it re-engages instantly.

Aro Equipment Corp., Industrial Div., Bryan, Ohio.

Use postpaid card. Circle No. 76

ALL STEEL WIRE STRIPPER HAS REMOVABLE BLADES



A tool which works like a pair of pliers, strips insulation from both stranded and solid wire.

A single squeeze on the handles, strips wire clean, without nicking. After wire is removed, a second squeeze releases arm and the stripper is ready for the next wire.

According to the manufacturer, perfect alignment of stripping holes to prevent cutting or scoring of wire, is assured by "V" notches on the stripping blades. The upper blade remains stationary, while the lower one moves up and down. Stripping blades are removable for sharpening and may be replaced if necessary.

Three sizes include: Model AS-02 for Nos. 22-10 wire, Model AS-2 for Nos. 18-10 wire, and Model AS-3 for



HUBBELL COLD HEADING MAKES THEM FASTER AND BETTER

Small fasteners like these Hubbell cold headed parts represent an area of saving often overlooked by management, who give careful attention to the cost and design of major components and little or none to the parts that hold them together. Yet here is the area where savings can be effected most easily and quickly.

Why pay for special tolerances and secondary operations when Hubbell engineers can design and mass produce a cold headed part that is stronger, cheaper and more uniform. For example, all of the above, and thousands more like them, have

been specially designed for Hubbell cold heading. And each one helped to make the end product faster and better.

Investigate for yourself. Simply send us a blueprint of the part or a sample for analysis. Our engineers will gladly estimate.



This quality can be your greatest production economy. For standards or specials, call Bridgeport, EDison 3-1181.



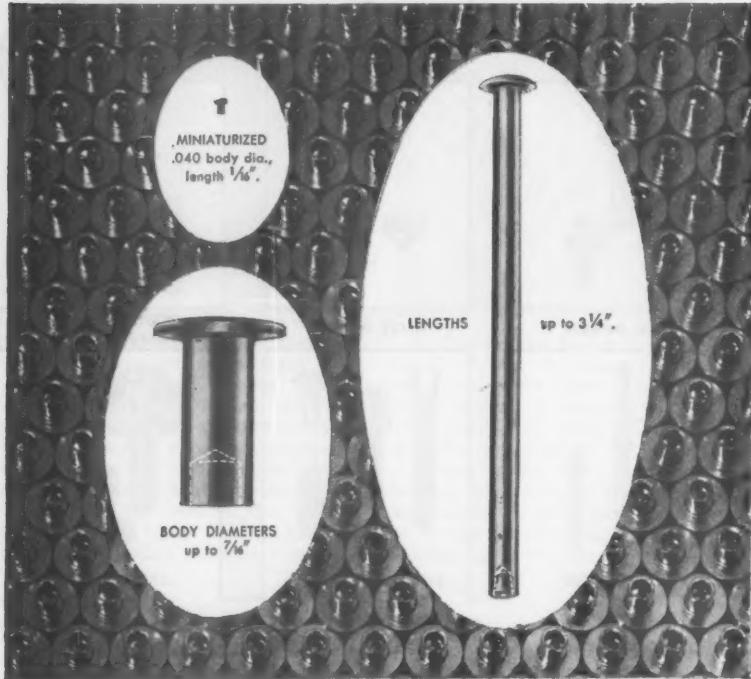
Quality
FASTENERS

HARVEY HUBBELL, INCORPORATED
Machine Screw Department, Bridgeport 2, Connecticut

See the Hubbell Fastener Catalog in Sweet's Product Design File 7/Hu.

Use postpaid card. Circle No. 235

Look at this Size Range of Semi-Tubular Rivets... it's the way to lower cost



Miniaturized components and also large complete assemblies can now have all the money-saving advantages of using single and multiple automatic riveting. This is due to the wider size range of semi-tubular rivets now available and which can be used in conjunction with motor and pneumatic driven automatic riveting machines.

Today, there is hardly a fastening problem, involving even fragile materials, that does not warrant consideration of low-cost semi-tubular rivet setting.

Our Factory Riveting Specialists are ready to help you obtain the **REAL COST FACTS** on your own specific fastening problem. There is no obligation.



FOR YOUR FILES

Chicago Rivet Catalog describes 1388 standard tubular and split rivets and 25 single and multiple automatic rivet setters.



AIR-POWERED RIVETING

contains description and specifications of 8 single, multiple riveters—also rivet setters designed for automated operation.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb)

Branch Factory: Tyrone, Pa.

Use postpaid card. Circle No. 236

Nos. 14-8 wire. Over-all length of stripper is 7½", weight 12½ oz.

Holub Industries, Sycamore, Ill.

Use postpaid card. Circle No. 77

BINOCULAR MAGNIFIER USED FOR INSPECTION & ASSEMBLY



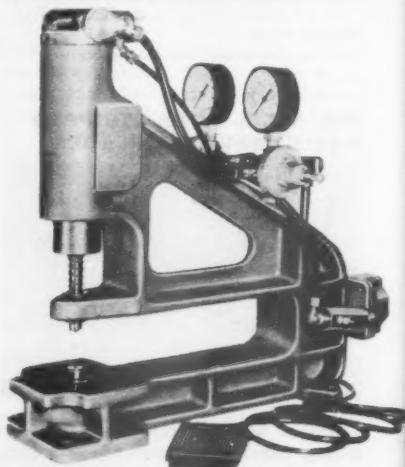
To insure accurate inspection and assembly of precision parts, the Magni-Focuser gives a greatly magnified, needle sharp vision in three dimensions.

The binoculars may be used with or without eyeglasses and weigh only three ounces.

Edroy Production Co., Dept. AF, 480 Lexington Ave., New York 17, N.Y.

Use postpaid card. Circle No. 78

PRESSTAKER HAS ONE CYCLE AUTOMATIC OPERATION



Presstaker has a powered hold-down which eliminates the hand lever for pressing, and the hand release for striking impact. Replacing both with a single foot switch, for automatic synchronizing of both operations, the operator can use both hands to position the work.

Air, at controlled pressure, drives the ram downward to hold down the parts or secure a press fit. As the desired hold-down pressure is reached, an automatic valve releases compressed air to the staking punch inside the hold-down ram, completing the cycle.

Completely interchangeable hold-downs and stakes are available for a

assembly and fastener engineering

MAY, 1961

(Not valid after July 31, 1961)

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wide range of work requirements.

Cramer Controls Corp., Miller St., Centerbrook, Conn.

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TORQUE SCREWDRIVER OFFERS INCH-OUNCE RANGE



An inch-ounce torque screwdriver in both fixed setting and adjustable models is now available.

The adjustable model, called the TS-100, has a torque range from 4 to 100 inch-ounces. Adjustment is made by simply setting a micrometer type dial located in the neck of the tool. The tool contains a $\frac{1}{4}$ " square-male drive, is $6\frac{1}{2}$ " over-all and weighs only 8 ounces.

The fixed setting model, called the TS-SN1, has a torque range from 1 to 100 inch-ounces, is 5" over-all and weighs only $6\frac{1}{2}$ ounces.

R. N. Hunter Sales Co., 9851 Alburstus Ave., Sante Fe Springs, Calif.

Use postpaid card. Circle No. 80

MINIATURE PIN VISSES HAVE SOLID LOCKING CHUCKS



Designed for ease of handling, miniature pin vises have a nickel plated swivel top, knurled brass handles and solid locking chucks that insure positive grip when holding or drilling stock.

Available in two sizes, the PV-1 will accept drills and stock from .0135" to .031". The PV-2 takes diameters from .032" to .0635".

Moody Machine Products, Inc., 42 Dudley, Providence, R.I.

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CONTROL SWITCH REGULATES FLOW RATE OF FASTENERS

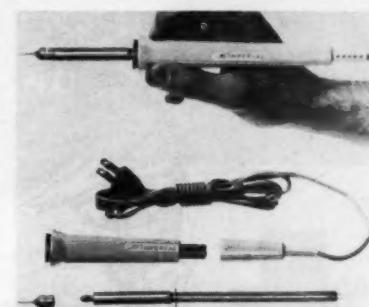
A pressure-actuated control switch is sensitive to the movement of small or lightweight parts. Unlike photoelectric eyes and proximity controls, the switch employs pressure of moving work-pieces to maintain the desired flow rate. A counter weight on the sensing arm permits slight adjustment of the actuating pressure.

Features of the Feedall 110 include, 110 or 220 volt operation, practical use for non-magnetic materials, and wide range of application on parts feeders, conveyors, special operation machines and handling equipment.

Feedall, Inc., 38399 Pelton Road, Willoughby, Ohio.

Use postpaid card. Circle No. 82

SOLDERING IRONS HAVE INTERCHANGEABLE PARTS



A new line of soldering irons feature complete interchangeability of components from cord sets to tips.

The components for the Imperial soldering irons include 25, 30, and 40 watt heat cartridges; color handles, three types of color-keyed cord sets.

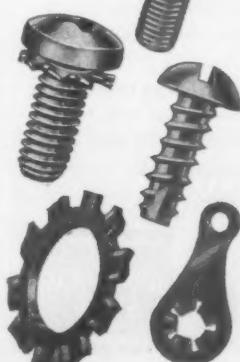
A total of 42 interchangeable soldering tips are also available in iron clad 24k gold plated, Armco and tellurium copper.

Ungar Electric Tools, Electronic Division of Eldon Industries Inc., 1475 E. El Segundo Blvd., Hawthorne, Calif.

Use postpaid card. Circle No. 83



Need a fast solution to a fastener problem?



YOU GET INDIVIDUALIZED SERVICE FROM THOMPSON-BREMER

We are one of the few fully integrated manufacturers of Sems, lock washers, thread-cutting screws, terminals and cold-headed specialties. Since our engineering services and components manufacturing are together under one roof, we are particularly well able to give you fast, individualized service at competitive prices. We'll bid on your specials requirements, or fill orders for standard items on short notice from the extensive line of EVERLOCK products stocked by your local distributor. Send for catalog and samples or call your EVERLOCK representative.

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 **Everlock**

INDUSTRIAL FASTENERS

Thompson-Bremer & Co.
Division of
American Machine
& Foundry Company

Thompson-Bremer & Co.

Dept. 6124

228 N. LaSalle St.,

Chicago 1, Ill.

Please send me _____ EVERLOCK fastener catalogs and _____ sample sets of EVERLOCK industrial fasteners and cold-headed specialties.

Name _____ Title _____

Company _____

Street _____

City _____ Zone _____ State _____



Bethlehem engineers redesigned these cost-saving specials.



for Strength
... Economy
... Versatility

Each of these special fasteners was redesigned to do a better job. And each represents a reduction in cost for the customer. Bethlehem's fastener engineers were able to come up with improved designs to solve a specific problem.

Perhaps a fastener you are now using should be studied to see if its redesign could cut your costs. Just send us a sample of the part, or a drawing or sketch of what you need. Maximum results will be obtained when you supply a detailed description of the end use.

Our fastener engineers will look it over and give you an honest appraisal of what can be done. Call the nearest Bethlehem sales office. Or write to us at the address below.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa. Export Sales: Bethlehem Steel Export Corporation

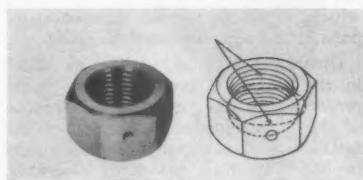
BETHLEHEM STEEL

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WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners or methods
use the handy postpaid card opposite page 58.



See No. 90

TWO-WAY LOCK NUT FOR AUTOMATIC ASSEMBLY

A re-usable, double chamfered lock nut is designed for automatic application. The double chamfer allows the two-way lock nut to be applied from either side and eliminates the need for selective devices.

The locking device of the nut is in the body of the nut, so that greater locking power is assured when the nut is mounted flush with the end of the bolt or when all threads are not used.

The nut uses two locking principles; it is ovalized to give it 180° spring, and the threads are deflected at the point of lock, so that the nut can be locked in any position.

The lock nut is furnished in sizes No. 5 through 1 1/4", American Standard finished dimensions. Other sizes furnished on order as specials.

MacLean-Fogg Lock Nut Co., 5535 N. Wolcott Ave., Chicago 40, Ill.

Use postpaid card. Circle No. 90



See No. 91

STAINLESS STEEL CLAMPS FOR HIGH TEMP. HARNESSING

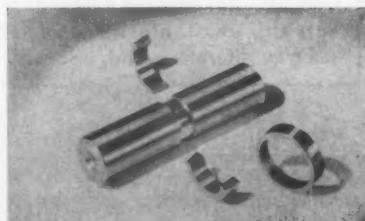
Temperatures as high as 1500° F are resisted by lightweight stainless steel cushion clamps.

Both the clamp and its cushion are made of type 321 stainless steel, meeting MIL-8-6721 specifications. The cushion is corrugated to furnish a spring action for high-frequency low-amplitude vibration.

The TA1500 series clamps are available in a size range from 1/4" to 4" id.

TA Manufacturing Corp., 4607 Alger St., Los Angeles 54, Calif.

Use postpaid card. Circle No. 91



See No. 92

SHAFT COLLAR FEATURES TAPER-LOCK

A conical-shaped split inner ring and locking retainer ring withstands high thrust loads in one or both directions and provides accurate location for

shaft-mounted parts. The split inner ring locks into the shaft, eliminating turned shoulders. Quick, simple assembly is completed by the tapered fit of inner ring and retainer.

In addition to conventional shaft collar applications, the taper-lock device can be used to connect air or hydraulic cylinder shafts to other members in high-thrust load applications.

The Taper-Lock Shaft Collars are available in all sizes up to 4" diameter, external or internal types.

Bearing Accessories Co., 7320 Lake Shore Blvd., Mentor, Ohio.

Use postpaid card. Circle No. 92

PASTE SOLDER MATERIAL JOINS STAINLESS STEEL

A paste solder with solder alloy, flux, and neutral binders in stable suspension is designed primarily for tough to solder stainless steel materials.

The material is combined with an acid type flux with an easily removable residue. Simple dipping in water while hot or soaking in water while cold will remove all active residual particles after soldering.

The paste solder is suitable for use with automatic applicators, making complete automatic soldering possible.

The WC series material easily solders the 304 and 430 grades of stainless steel.

Fusion Engineering, 17921 Roseland Ave., Cleveland 12, Ohio.

Use postpaid card. Circle No. 93

16,000 PSI LINES & FITTINGS FEATURE LEAK PROOF SEAL

Steel line and fittings for pneumatic or hydraulic service feature a leak-proof metal crush seal and have working pressures up to 16,000 psi with 48,000 psi burst pressure.

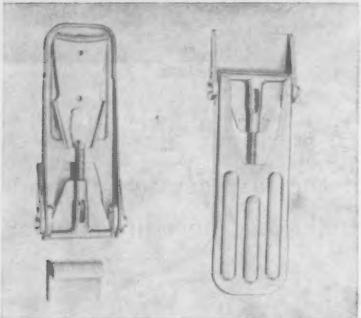
Two sizes are available, 1" with a $5/8"$ diameter flow passage and $3/4"$ with a $3/8"$ diameter flow passage. The flow passage of both sizes are full

unrestricted diameter in both the line and fittings.

The steel line and fittings are being used in many applications with helium at pressures from 6,600 psi to 15,000 psi where leakage cannot be tolerated.

Pressure Components, Inc., 3429-D Ocean View Blvd., Glendale 8, Calif.
Use postpaid card. Circle No. 94

ADJUSTABLE DRAWHOOK UNIVERSAL TENSION LATCH



An adjustable drawhook, universal tension latch is designed for use on re-usable shipping containers, transit cases and for other general purpose latch requirements.

It provides up to $\frac{1}{2}$ " adjustment with an ultimate tensile strength of 1000 lbs. Type 46L, is completely interchangeable, model for model, with fixed drawhook latches and its design gives ex-

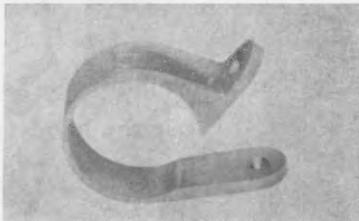
cellent load deflection characteristics without springs.

The common pivot of both the drawhook and handle prevents accidental opening due to vibration and shock or buckling and misalignment of container sections.

When the latch is fully open, the drawhook stows flat within the handle to protect it against damage during loading.

Camloc Fastener Corp., Dept 2A, 14 Spring Valley Rd., Paramus, N.J.
Use postpaid card. Circle No. 95

NYLON CLAMPS WITHSTAND VIBRATION, CORROSION



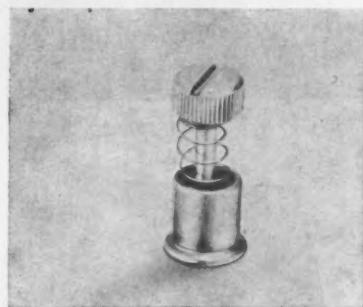
A nylon clamp for use with hydraulic lines or electrical wiring harness withstands vibration, pinching of wires or bending at any point.

Among the important design features to the Clamp-Tite clamp is the molded wedge which prevents entrapment or pinching of wires in harness bundles, and which also provides a true round diameter.

The clamps are impervious to nearly all corrosive liquids and fuels, are self-extinguishing and will not deteriorate in salt air.

Olympic Plastic Co., Inc., 3471 S. LaCienega Blvd., Los Angeles 16, Calif.
Use postpaid card. Circle No. 96

SPRING EJECTED ELECTRONIC PANEL FASTENER



Now available from stock in numerous sizes is an access panel fastener which, when disengaged, automatically pops into fully retracted position.

Operating in a tapped hole or insert in the frame, it provides zero inside projection when unfastened. Because of the spring-loaded design, when the fastener is disengaged it is firmly held in full retraction, providing clearance for panels to move laterally with respect to one another.

AIRETOOL IMPACT WRENCH SPEEDS FASTENING OPERATIONS



Now . . . a fast-acting, air-powered impact wrench that steps up assembly fastening and stands up under three-shift operations. Heat-treated aluminum housing, rugged design and unitized construction make maintenance and handling easy; hand-fitted pistol grip, trigger action and minimum torque cuts operator fatigue; high run-down speed, low air consumption, self-lubricator and air strainer increase efficiency and service life; no springs or centrifugal force required for operation; available in two reversible models with bolt capacity of $\frac{1}{2}$ inch. Model 625 with $\frac{1}{2}$ " drive square, 626 with $\frac{5}{8}$ " square. For details and in-plant demonstration of this or any of Airetool's complete line of pneumatic nutsetters, screwdrivers, grinders, drills, etc., call your nearest representative . . . he's in the Yellow Pages.



Representatives in principal cities of the free world.

Use postpaid card. Circle No. 239

NEW NUTS

COLD FORMED

FOR BETTER uniformity, concentricity and strength at low cost.

SAVE money—GET A BETTER nut.

COMPLETE STOCK.
Made in U.S.A.

Complete line of Cold Punched nuts also available. Send for samples, literature and prices.



TRANS NATIONAL FABRICATORS CORP.

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LINDEN, NEW JERSEY HU 6-4815

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Assembly & Fastener Engineering

INDUSTRIAL RETAINING RING PRICES REDUCED UP TO 51%



Series 1000, Series 3000 and Series 3100 Industrial Retaining Ring prices—in quantities up to 100,000—have been greatly reduced.

Thanks to modern, efficient production methods you can now get these Industrial Retaining Rings—either pre-stacked or bulk packed—at new, low prices . . . and pay less for pre-stacked rings than you have been paying for bulk packed. Reductions apply to standard materials and finishes.

Use this coupon to send for your new, revised IRR Price List.

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Please send me, free, a copy of the new 1961 IRR Price List—61A.

I would also like to have your representative call.

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IRR *Originators of modern retaining ring dispensing*
INDUSTRIAL RETAINING RING COMPANY
57 Cordier Street, Irvington 11, New Jersey
Use postpaid card. Circle No. 241

The No. 53 spring ejected retractable screw fastener assembly is available in stainless steel in seven thread sizes from 8-32 to $\frac{1}{4}$ -28, and three head sizes, with or without slots.

Southco Division, South Chester Corp., Lester, Pa.

Use postpaid card. Circle No. 97

STAINLESS CLAMPS FOR FLEXIBLE PLASTIC PIPE



Two types and four series of corrosion resistant clamps for flexible plastic pipe are specified for use on all hose and plastic pipe connections for equipment, motors, pumps and water systems use.

Sure-Tite clamps are packed in several different sized packages for handling ease.

Wittek Manufacturing Co., 4305 W. 24th Place, Chicago 23, Ill.

Use postpaid card. Circle No. 98

PIN TERMINALS FOR PRINTED CIRCUIT BOARDS

Two printed circuit pin terminals, No.'s 2970 and 2971 are designed for

any .040 socket, such as a miniature tube socket. Both parts have three staking shank lengths of .051", .082" and .113".

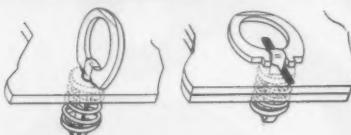
They may be used for staking to boards which are later encapsulated and individual pin arrangements can be made so that the standard tenth printed circuit grid may be utilized.

The pins are machined in brass and finished with hard gold over silver plate.

Cambridge Thermionic Corp., 45 Concord Ave., Cambridge 38, Mass.

Use postpaid card. Circle No. 99

SPRING-LOADED LATCH FOR REMOVABLE PANELS



An inexpensive spring-loaded latch may be used in any application requiring a quarter-turn sheet metal type of fastener. It requires no riveting, screws, spot welding or special tools.

The latch is cadmium plated, and has a wide application range, accommodating thicknesses up to $\frac{1}{4}$ ".

Monadnock Mills, San Leandro, Calif.

Use postpaid card. Circle No. 100

SWIVEL PAD CLAMPS MADE IN SMALLER SIZE



Swivel pad clamps, widely used in industry for holding parts in jigs and fixtures and in original equipment applications where parts must be held without damaging their surface, are now made in a 10-32 x $\frac{1}{2}$ " size.

The model SC-324 features a ball joint pad construction which provides smooth angle adjustment and rotation of the pad. To accommodate off-angle surfaces, the pad swivels $7\frac{1}{2}^{\circ}$ each side of center in all directions.

Vlier Engineering Corp., 8900 Santa Monica Blvd., Los Angeles 46, Calif.

Use postpaid card. Circle No. 101

SILVER CONDUCTIVE EPOXY AVAILABLE IN TWO FORMS

A silver conductive epoxy with a resistivity approaching the resistance of metals, between .01 ohms/cm and .0001

LONG-LOK® SELF-LOCKING SCREWS VIRTUALLY ELIMINATE DOWNTIME ON THESE HIGH SPEED CITRUS JUICE EXTRACTORS

Each of these stainless steel automatic machines manufactured by Brown Citrus Machinery Corporation, Whittier, California, ream in excess of 700 fruit per minute, produce approximately 500 gallons of juice an hour.

Downtime could be very costly. To help avoid such a contingency, Long-Lok Self-Locking Screws were used in the assembly of these machines

because: *they are made of stainless steel; they are vibration resistant; they are re-usable.* The result:

continuous, trouble-free operation—highest functional reliability.

Is there an idea here for your fastener application?



Write for
Catalog LL-61



LONG-LOK CORPORATION

4101 REDWOOD AVENUE • LOS ANGELES 66, CALIF.
EXmont 1-7128 • TWX 3 MON 7146

LONG-LOK EASTERN CORPORATION

66 Urban Ave., Westbury L.I., N.Y. EDgewood 4-8150
Manufacturers and Representatives in Principal Cities

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Assembly & Fastener Engineering

ohms/cm is available in two paste forms. One is a two component room temperature cure paste, and the other is a one component heat curing paste.

The epoxy solder is ideal for field repair work, particularly on crowded printed circuits where solder temperatures might damage heat-sensitive components. Its bond strength is higher than the usual metal solders and it can be used to make a conductive bond with most any material.

Epoxy Products, Inc., 137 Coit St., Irvington, N.J.

Use postpaid card. Circle No. 102

CLAMPS NOT AFFECTED BY WIDE TEMP. EXTREMES



Adjustable cable clamps and cable ties are now available in a new material providing complete flexibility from minus 65° F to plus 225° F. They are unaffected by moisture and are durable, even in applications subject to heavy flexure and vibration.

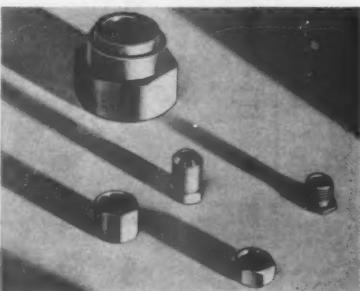
They will not become brittle due to low temperature exposure. Nor will they show any appreciable "stretch" at their upper rated service temperature.

Lok-Straps can be opened, closed and re-adjusted repeatedly without damage. No special tools are needed. A miniature quick-release tab holds the band securely around wires. It also allows adjustments to accommodate wire harnesses from $\frac{1}{8}$ " to 2" diameter.

Panduit Corporation, Dept AE-3, 17301 Ridgeland Ave., Tinley Park, Ill.

Use postpaid card. Circle No. 103

HEX BRASS RODS FOR NUTS IN WIDE RANGE OF SIZES



Radius-cornered free-cutting brass hexagon rods, used primarily for making brass bolts, nuts, hydraulic and automotive fittings, and other parts where the hex serves as a wrenching shape, are now being made in all standard sizes.

The RC-Hex rods have a rounded-corner design which provides rod

NEW *Snap-on*



MAGNETIC SOCKETS last ten times longer — give re-usable magnet bonus

Cutaway view showing socket, magnet, self-tapping screw. Snap-on magnetic sockets are available in the following sizes: $\frac{1}{4}$ -in. drive for $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$ -in. sockets; $\frac{3}{8}$ -in. drive for $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{1}{2}$, $\frac{9}{16}$ -in. sockets; $\frac{1}{2}$ -in. drive for $\frac{1}{2}$, $\frac{5}{8}$, $\frac{11}{16}$ -in. sockets.



To remove magnet, simply tap it out of the socket with an appropriate punch.



To re-insert, just tap magnet into socket with Snap-on assembly punch. The entire operation takes about a minute.

SNAP-ON TOOLS

FOR ALL INDUSTRY

8033-E 28th Avenue • KENOSHA, WISCONSIN

Use postpaid card. Circle No. 243

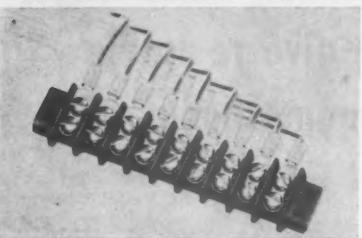
weight saving, longer screw machine life, increased rod size capacity and an improved product appearance.

In design, the radius corner of the hex rod is equal to 11% of the dimension across the flat.

Titan Metal Manufacturing Co., Bellafonte, Pennsylvania.

Use postpaid card. Circle No. 104

TERMINATOR FOR FLEXIBLE CONDUCTORS EASILY APPLIED



A simple terminator ends the laborious preliminary preparation of scraping, abrading or heating, normally required to terminate flexible copper conductive tape, or custom printed copper oxide tape.

A choice of basic configurations of Flex-Terms provides a rapid and reliable means to connect tape to printed circuit boards, pin or two-piece socket connectors and to barrier or terminal strips.

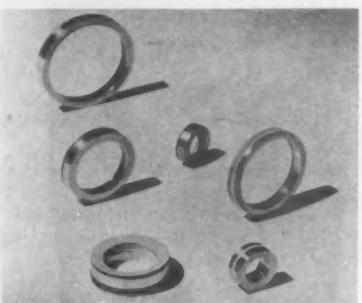
Using modified pliers for bench or field assembly, a simple crimping

action permanently locks the tape into the three-piece terminal.

Hi-Shear Corporation, 2600 W. 247th St., Torrance, Calif.

Use postpaid card. Circle No. 105

SPRING LOADED SEAL IS SELF ADJUSTING TO WEAR



A spring-loaded, self-conforming polymer seal is used for applications in reciprocating and low-speed rotary shafts under high pressure liquid and gas conditions.

The seal combines polymer and spring steel in a principle insuring efficient operation over a temperature range of minus 320° F to plus 500° F and under pressures up to 10,000 psi.

Seated around a shaft, the seal sets up a load toward the shaft, its polymer gasket deforming under constant pressure to produce the seal.

The device is engineered so the polymer deformation is always toward the shaft, and self-adjusting to creep and wear.

Del Manufacturing Co., 1584 E. 20th St., Los Angeles 11, Calif.

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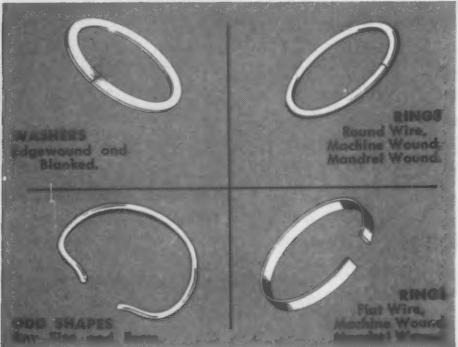
NYLON CABLE CLAMP FOR SUB MINIATURE USE



New sizes and types of nylon cable clamps cover applications from subminiature to jumbo sizes. The smallest unit, Type J, will hold a cable smaller than 1/16" diameter. Type 9 will accommodate cables or bundles up to 1 1/4" diameter. Types and sizes of clamps for special fastening applications include flat clamps, molded half-clips and snap clips.

The clamps range in size for .160" wide, .030" thick for close quarter installation up to 3/8" wide and .070" thick for larger jobs.

All nylon cable clamps meet MIL-P-17091A and Amendment 2, 17091B, and



solder preforms

Silver Copper Aluminum Soft Solders



Write for 16 page booklet on better brazing.

LUCAS-MILHAUPT Engineering Co.
5060 South Lake Drive, Cudahy, Wisconsin

Use postpaid card. Circle No. 244

HIGH SPEED equipment for better production, lower cost

RIVETING HAMMERS

Available in 10 sizes. Handle full range of work up to 2" diameter solid rivets. Quick to set up or change tools. Available in bench and pedestal models. Backed by finest, most complete tooling service in the industry.



NOISELESS RIVET SPINNERS

Motor-driven, noiseless, rugged. Spindle travel adjustable. Fast cycle. Produces absolutely uniform assemblies. Model E (capacity 1/8") and Model G (capacity 5/16") available in both bench and pedestal models, foot or AIR operated.



ELECTRIC SOLENOID PUNCH

Stakes, rivets, marks, cuts off, bends, crimps, etc. with positive alignment. 4 1/2" maximum vertical opening (2 3/4" minimum for tools and work). 1 3/4" spindle travel, adjustable downward. Fast travel. 3500-lb. impact. Single or dual, hand or foot control.



AUTOMATIC STAKING MACHINES

Pressure pad built into spindle firmly secures work before blow. Allows for variation in thickness. Delivers uniform blow every time. Quick, easy adjustment, wide power range. 4 sizes—bench and pedestal models, foot and air operated.



We manufacture the most COMPLETE LINE of assembly machinery on the market today, so generally can recommend the CORRECT TYPE MACHINE for any assembly application.

FREE Assembly Engineering Service

Just send samples or blueprints of parts to be assembled. We'll recommend the right tools, procedure and equipment to use . . . without cost or obligation.

HIGH SPEED HAMMER CO.

308 NORTON ST., ROCHESTER 21, N.Y.

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Assembly & Fastener Engineering

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20693 Type I; MIL-STD-242A and 242B (Ships) and MS-39014 (Ord).

Weckesser Company, Inc., Dept AE-3, 5701 Northwest Hwy., Chicago 46, Ill.
Use postpaid card. Circle No. 107

TEFLON-STAINLESS STEEL BUSHING REDUCES FRICTION

A line of stainless steel bushings with reinforced Teflon inserts permanently bonded to the inside diameter are said to reduce friction.

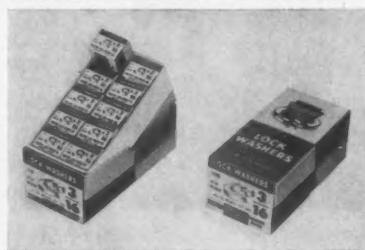
According to the manufacturer, Fluor-O-Bearings are particularly suitable to applications involving liquid oxygen or other exotic fluids.

A special design technique of encapsulating glass cloth in the Teflon, increases wear characteristics and virtually eliminates cold flow.

The Fluorocarbon Company, 1754 S. Clementine, Anaheim, Calif.

Use postpaid card. Circle No. 108

LOCK WASHER PACKAGING AIDS INVENTORY CONTROL



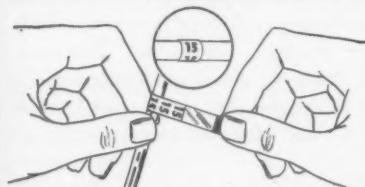
A number of advantages are claimed for a decimal packaging system of lock washers. It enables the handling of lock washers in small quantities and smaller sizes.

As an aid to inventory control, washers are packed in 50's or 100's, depending on the size, ten packages to a labeled carton.

Positive Lock Washer Co., 187 Vandercroft St., Newark, N.J.

Use postpaid card. Circle No. 109

SELF-LAMINATING MARKERS IDENTIFY COMPONENT LEADS



Self-laminating wire markers offer high resistance to all conventional oils, greases, chemicals, fluids and other foreign matter.

Each self-adhering marker is partly precoated and partly transparent with a self-contained laminating extension. When applying a coded marker around wire, the remaining protective clear portion wraps around, causing it to laminate permanently over the coded area.

Westline Products, Division of Western Lithograph Co., 688 E. 2nd St., Los Angeles 54, Calif.

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ALL Bristol socket screws are available with NYLOK*

provides a self-locking grip against loosening due to vibration

For maximum reliability under severest conditions, Bristol offers its complete line of socket screws with the famous NYLOK self-locking inserts, including Bristol Multiple-Spline and hex socket set screws, socket-head cap screws, flat-head socket cap screws, button-head socket screws, socket shoulder screws, and socket pipe plugs. Here are their big features:

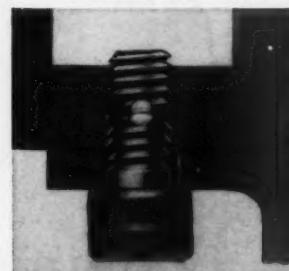
They LOCK

... Bristol socket screws with patented NYLOK principle *lock* by means of a tough nylon pellet, permanently imbedded in the screw body. The pellet projects slightly beyond the crest of the threads and is compressed when the screw is inserted, setting up a counter-force that creates a strong engagement of the threads opposite the pellet. All necessity for lock washers, or other auxiliary holding devices, is eliminated.



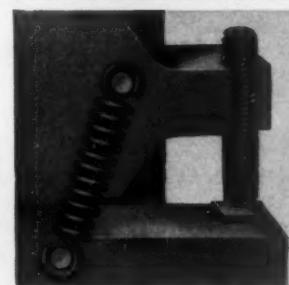
They SEAL

The NYLOK nylon pellet acts as a dam along the threads of the Bristol socket screw and positively stops all fluid leakage ... far superior in this respect to ordinary screws which permit fluid leakage along a spiral path between the non-load-bearing thread flanks of screw and threaded hole.



They ADJUST

... and stay adjusted, time after time. Bristol-NYLOK socket screws make ideal adjusting screws because they provide the same effective locking action regardless of whether they are fully seated. And, the pellet's resilience makes it possible to change adjustments with ease and accuracy.



ACCO



Get full data on Bristol socket screws with NYLOK today ... and remember, Bristol still offers the most complete socket screw line on the market, both plain and with NYLOK. See your authorized Bristol distributor or write the address below.

A.O.11

*T.M. Reg. U.S. Pat. Off. The Nylok Corporation.

Precision socket screws since 1913 ... by the makers of famous Bristol Precision Instruments

Bristol's Hex Socket Screws

Bristol's Multiple-Spline Socket Screws

Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter.

The diagram illustrates several types of Bristol socket screws, including hex socket screws, multiple-spline socket screws, and flat-head socket cap screws. It also shows a socket pipe plug. The text indicates that these screws are made in sizes as small as No. 0 and up to 1½" diameter, and are available in Alloy Steel and Stainless Steel.

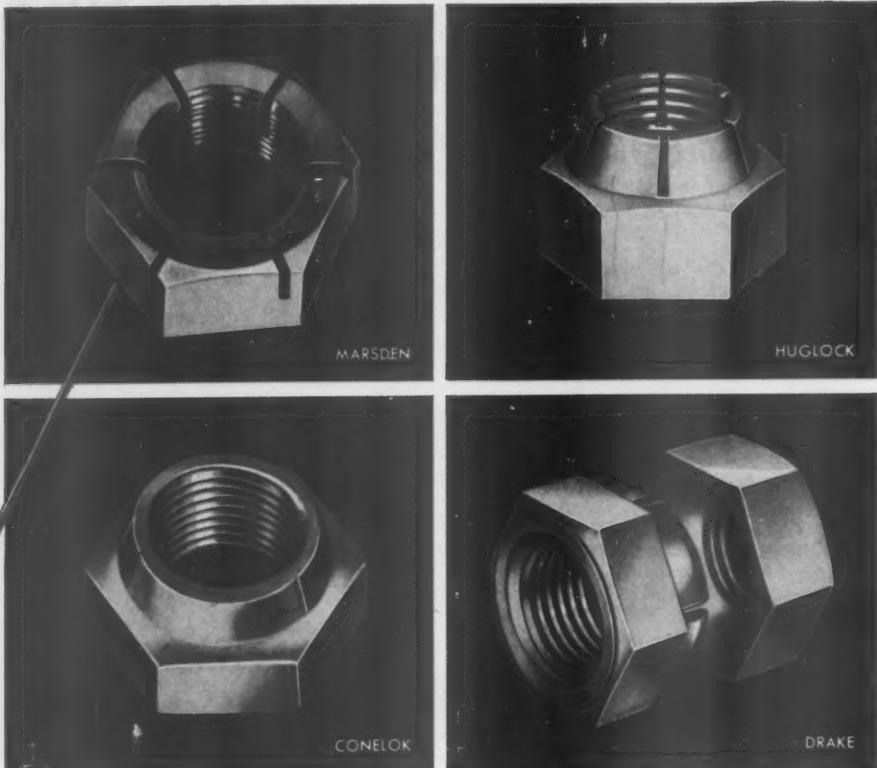
THE BRISTOL COMPANY Socket Screw Division
Waterbury 20, Conn.

A SUBSIDIARY OF AMERICAN CHAIN & CABLE COMPANY, INC.

See us at the Design Engineering Show at Booth 1036
and the ASTE Tool Show at Booth 3318.

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NAT'S
quick facts
about
Fasteners...



Looking for the **right** lock nut? Put these four high on your check list

By taking an early look at these National all-metal lock nuts, you may often be able to make quick work of finding the locking member that best meets the requirement of your particular job.

Once over lightly, here are the advantages they offer you.

MARSDEN—For minimum cost and average conditions. Free-running until seated. One-piece, fully re-usable.

HUGLOCK—For use under adverse conditions. Locks without seating. One-piece design, and fully re-usable.

CONELOK—For applications requiring high-fatigue life, as assured by closed stress paths in Conelok's locking sections. Locks without seating. One-piece design, and fully re-usable.

DRAKE—For use under severe stress, shock or vibration. Free-running until seated, or can be locked at any point by using two wrenches. Two-piece design, and fully re-usable.

Take a good look at all four, and at the advantages they may be able to offer in your product assemblies. You may not be thinking of an application right now, but get the literature* and keep it handy in your files, just in case.

*There's a folder on the Conelok, and a booklet on the others. Write for your copies.



The National Screw & Mfg. Company • Cleveland 4, Ohio

California Division, The National Screw & Mfg. Company • 3423 South Garfield Avenue, Los Angeles 22, California

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Assembly & Fastener Engineering

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USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite page 58.

SOLDERING IRONS

A full-color 8-page brochure describes the new Imperial soldering iron which features complete interchangeability of components from tips to cord sets. A total of 42 thread-on tips are available, while handles and cord sets are available in three cool pastel shades. Ungar Electric Tools, Electronic Division of Eldon Industries Inc., 1475 E. El Segundo Blvd., Hawthorne, Calif.

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contact of superior physical and electrical properties at a lower cost. Gibson Electric Sales Corp., Delmont, Pa.

Use postpaid card. Circle No. 116

SOCKET JAM SCREWS

Detent, set screw and pin applications of socket jam screws are described in four page information folder. Sizes of available screws and prices are also included. Holo-Krome Screw Corp., Brook St., Hartford 10, Conn.

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ADHESIVE SPECIFICATIONS

A 54-page catalog listing official government specifications for a wide variety of adhesives, coatings and sealers lists, in numerical form, military specifications, specification definitions, intended application and the corresponding 3M adhesive, coating or sealer that meets these specifications. Minnesota Mining & Manufacturing Co., 900 Bush Ave., St. Paul, Minn.

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ELECTRONIC WELDING

A five-chapter technical report, "The Metallurgy of Electronic Welding," covers: the resistance welding process; significant factors in resistance welding; evaluation of weldability of various materials; weldability of clad materials; and dissimilar materials. Illustrated with charts, graphs and photomicrographs. VTP Division, Hughes Aircraft Co., 2020 Short St., Oceanside, Calif.

Use postpaid card. Circle No. 119

ATOMICALLY BONDED RIVETS

Technical information bulletin No. 400, describes Atomiclad electrical contact rivets. This contact rivet is made by a new process which atomically bonds a noble metal contact surface to a rivet body of base metal, providing a

CONTROL KNOB SELECTOR

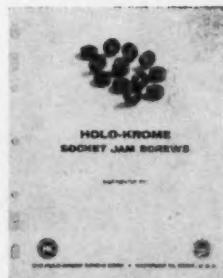
A specially designed slide rule and wall chart, both featuring finger-tip selection of more than 345 styles of control knobs, is available to equipment design engineers. The compact, easily read knob selector also relates all dimensions to scale drawings of any knob style and indicates the order number of the selected knob on the back. All control knobs shown on the selector or the wall chart meet the most recent MS91528B military specifications. The permanent wall chart offers the same data as the selector plus dimensional pictures of each style knob. The chart is 22" wide and 34" high. Raytheon Company, Lexington 73, Mass.

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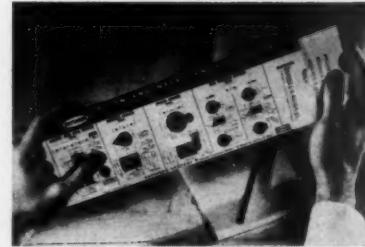
TORQUE-TENSION MANUAL

New 18-page design manual No. 6101 includes twelve tables listing specific recommended installation torque values for thin and standard height UNC and UNF hex type stop nuts. It discusses factors to be considered in selecting a tightening torque; also the effects of the use of lubricants. Additional data includes tables of tensile stress areas and tables of bolt strengths. Elastic Stop Nut Corporation of America, 2330 Vauxhall Rd., Union, N.J.

Use postpaid card. Circle No. 121



See 117



See 120



See 121

**the versatile, NEW
ELECTRO PUNCH**
can increase your
light assembly
production as
much as 100%



**BLACK &
WEBSTER**
INC.
370 PLEASANT STREET,
WATERTOWN, MASS.

Gentlemen:

Please send me information about the Black & Webster Electropunch (Model C) for light punching, heavy duty swaging, staking and riveting which:

- 1. delivers up to 75 blows per minute
- 2. has precisely controllable impact up to 10,000 lbs.
- 3. never needs air lines
- 4. doesn't require skilled labor
- 5. sets up easier and quicker
- 6. cuts costs, time, and labor
- 7. is bench mounted

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Use postpaid card. Circle No. 248

OEM PARTS MANUAL

Bulletin 921 describes frequently used production parts in OEM design. The 17-page manual was prepared for use by design engineers and contains specifications on such products as adapter couplings, bushings, elbows, tees, hose assemblies and brackets. Lincoln Engineering Co., Original Equipment Sales Div., 4010 Goodfellow Blvd., St. Louis 20, Mo.

Use postpaid card. Circle No. 122



ELECTRIC WELDERS

Complete line of electric welders, both ac and dc, are described in twelve-page catalog. Each welder is photographically shown, and described. Included also are a line of electric welder accessories and controls. Miller Electric Manufacturing Co., Inc., 718 S. Bounds St., Appleton, Wis.

Use postpaid card. Circle No. 123

MOVIE ON ADHESIVE USE

Assembly line procedures on the use of Eastman 910 adhesive in four well-known companies are documented in a 15-minute, 16 mm film which is available to designers, engineers, and technical groups upon letterhead request. The film is available from either Armstrong Cork Company, Industrial Division, Lancaster, Pa., or Eastman Chemical Products, Inc., 260 Madison Ave., New York 16, New York.

Use postpaid card. Circle No. 124

DRY LUBRICATING STICK

Typical extreme pressure applications of lubricating sticks are the subject of a data sheet No. 128. The lubricating stick, which contains molybdenum disulfide solid lubricant in a resin binder, is particularly useful on grinding wheels and cutting tools. Other applications described include tools for cutting other materials such as paper and wood, friction surfaces of all types. When machined to shape, it acts as an actual self-lubricating bearing element in small machines. Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.

Use postpaid card. Circle No. 125

FLUXLESS SOLDERING

How to achieve fluxless soldering or coating of a variety of non-ferrous metals without the use of flux is described in Bulletin S-B-8. Included also is a description of several types of ultrasonic soldering units and accessories. Sonobond Corporation, West Chester, Pennsylvania.

Use postpaid card. Circle No. 126

SHORT-RUN SERVICE

Details about fast delivery on short runs of studs and threaded rod in machine screw sizes and large diameters, are contained in an information sheet. Made to blueprint or from stock, J-Bolts, U-Bolts, anchor bolts and similar fasteners in stainless steel, carbon and alloy steel, bronze and other metals are also listed. Star Stainless Screw Co., 699 Union Blvd., Paterson 2, N.J.

Use postpaid card. Circle No. 127

HOLD-DOWN CLAMPS

Catalog information sheet describes and illustrates hold-down clamps with exclusive patented steel welder's shield for welding service. Adjustable Clamp Co., Dept. HC-30, 417 N. Ashland Ave., Chicago 22, Ill.

Use postpaid card. Circle No. 128

TORQUE MEASUREMENTS

One section of a new 12-page brochure on torque measuring instruments includes formulas for computing power and efficiency and methods of using stroboscopes and tachometers for analyzing rotating motion. The brochure also illustrates how to measure the torque characteristics and speed of motors, gear trains, servo mechanisms, and potentiometers. Torque ranges covered are from $\frac{1}{4}$ gm/cm to 220 lb-in. Power Instruments, Inc., 7352 N. Lawndale Ave., Skokie, Ill.

Use postpaid card. Circle No. 129



ALUMINUM FASTENERS

Aluminum bolts and cap screws, machine screws, nuts, wood and sheet metal screws and rivets are shown in standard sizes in eight page information catalog. Included also are charts showing dimension and thread of fasteners. Aluminum Company of America, 1221 Alcoa Bldg., Pittsburgh 19, Pa.

Use postpaid card. Circle No. 130

DEBURRING TOOLS

Principal application and construction of deburring, chamfering and countersinking tools are fully described in four-page folder. Included also are dimensional drawings, and specification charts for each of the tools described. Nobur Manufacturing Co., 6860 Farmdale Ave., North Hollywood, Calif.

Use postpaid card. Circle No. 131

HARD SURFACING STEEL

A four-page illustrated 2-color engineering data sheet, No. 55, discusses typical uses of manganese steel and the need for hard-surfacing. It also includes

Assembly & Fastener Engineering

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HARPER AVAILABILITY

... fastenings at your fingertips!

Immediately available, from stocks in local distributor and factory warehouses, are millions of fastenings in over 7,000 different sizes, shapes and alloys to meet your critical demands. Harper maintains a constant inventory of more than 150,000,000 bolts, nuts, screws, washers and rivets in over 100 non-ferrous and stainless steel alloys to make this service possible. Even "specials" made to your specifications are promptly processed through Harper's completely integrated operation to meet your requirements. Availability of fastenings is a fact with Harper. Call your local Harper Distributor or branch office today for proof!

*shaping metals
that shape your future*

THE H. M. HARPER COMPANY
8200 Lehigh Avenue • Morton Grove, Illinois



HARPER



complete recommendations for application of three alloys. Illustrations of typical parts, hard-surfaced with overlays for improved wear resistance, accompany the discussions. Wall Colmonoy, 19345 John R. Street, Detroit 3, Michigan.

Use postpaid card. Circle No. 132

PUSH BUTTON CONTROL UNITS

Design information is given on three separate push button stations and control units. The units, plus selector switch units, standard pilot lights and push-to-test pilot lights are also described. The Clark Controller Co., 1146 E. 152nd St., Cleveland 10, Ohio.

Use postpaid card. Circle No. 133

INSULATED WIRE AND CABLE

Two technical service bulletins describe in detail a variety of cables. Bulletin No. 10A deals with flat cable types. The bulletin both illustrates and describes typical thermoplastic insulated cables. Bulletin No. 32 presents a similar break-down of coaxial, microphone, shielded and speaker cables. Technical data for each cable variety is included. Phalo Plastic Corp., 530 Boston Turnpike, Shrewsbury, Mass.

Use postpaid card. Circle No. 134

TIG WELDING TORCH

Describing the design features and application of the controlled angle torch for tungsten inert gas arc welding.

Bulletin WC-60 illustrates how the torch is used in hard-to-reach corners and at unusual angles. Complete specifications including weight, length, and materials of construction are also included. Falstrom Company, 222 Falstrom Ct., Passaic, N.J.

Use postpaid card. Circle No. 135

ASSEMBLY SCREWDRIVER

Informative fold-out sheet gives complete description of newly designed model 400, power screwdriver. Large photographic diagram gives details of construction. Also included are suggested methods of incorporating the automatic unit into assembly production runs. Shakeproof, Division of Illinois Tool Works, St. Charles Rd., Elgin, Ill.

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IT PAYS TO SEND YOUR FASTENER SPECIFICATIONS TO SPECIALISTS . . .



ERIE BOLTS • STUDS • CAP SCREWS • NUTS In Alloys • Stainless • Carbon • Bronze

The quality of your equipment can be no better than the quality of its smallest component . . . one of many reasons why it pays to send your fastener specifications to ERIE specialists. Here your specifications are produced with watchmaker's precision by craftsmen whose sole business for almost half a century has been the production of fasteners to customer, government or national standards . . . fasteners for railroads, refineries, diesels, farm and earth moving equipment and other heavy machinery. Be sure . . . send your fastener specifications to ERIE specialists.

A SUBSIDIARY OF



ERIE BOLT & NUT CO.
Erie, Pennsylvania
Representatives in Principal Cities

STAINLESS STEEL GUIDE

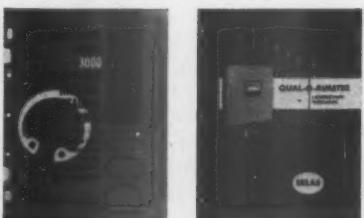
Stainless steel grades and a chart showing the grouping, structure, hardenability, AISI type and analyses of stainless steels is given in informative 18-page booklet. The booklet also contains charts showing corrosion resistance to various media, and comparative properties of stainless steels in the austenitic, martensitic and ferritic group. A handy reference check list for ordering stainless steels is also included. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.

Use postpaid card. Circle No. 137

PRE-STACKED RINGS

Catalog filler sheet, No. 30, lists all available 3000 series pre-stacked internal retaining rings available. Specifications for each ring, such as housing diameter, ring dimensions, groove dimensions, clearance and thrust strength are also listed. Industrial Retaining Ring Co., 57 Cordier St., Irvington 11, N.J.

Use postpaid card. Circle No. 138



COMBUSTION INDICATOR

A continuous reading instrument which accurately indicates changes in flame characteristics caused by variations in air/gas mixture is described and illustrated in eight-page bulletin Q-2.

Typical uses illustrated include brazing and soldering. Specifications and operation are completely detailed, including performance curves, a schematic diagram and an internal photograph with the nomenclature called out. Selas Corp. of America, Dresher, Pa.

Use postpaid card. Circle No. 138

QUICK-RELEASE CLAMPS

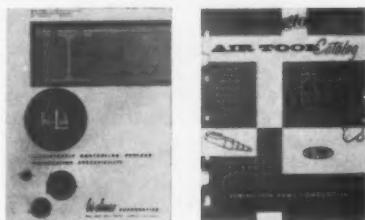
Bulletin describes features of miniature quick-release synchro clamp, which meets MIL-E-5272A. Showing dimensional drawings, and specifications, also included are ready reference charts giving specific data on available clamps. Timber-Top Inc., 38 Brooklyn Ave., Freeport, N.Y.

Use postpaid card. Circle No. 140

CONTROLLED PRELOADING

Fasteners with a controlled preload are described in a four-page brochure. Photographs and diagrams show typical installations, and fully describes the BUS version of the Hi-Lock fastener. Hi-Shear Corporation, 2600 W. 247th St., Torrance, Calif.

Use postpaid card. Circle No. 141



AIR TOOL CATALOG

Complete line of air tools is listed in 28-page catalog. Model numbers and specifications for grinders, impact wrenches, nut setters, clutch screw drivers, as well as attachments and accessories are fully described. Remington Arms Co., Inc., 25000 S. Western Ave., Park Forest, Ill.

Use postpaid card. Circle No. 142

INSERTS FOR SOFT MATERIAL

How a threaded insert is used to form electrical connections, while providing permanent brass threads in plastics, after molding, and in other soft parent materials, is described in bulletin P-102. A table lists the sizes of the inserts presently available from 4-40 through 8-32, dimensions of each size, and quantity prices. Additional information covers hole size, simple tools for anchoring the insert, strength of assembly, and the availability of application assistance. Phelps Manufacturing Division, Heli-Coil Corp., Danbury, Conn.

Use postpaid card. Circle No. 143

HEAT TREATMENT HANDBOOK

A 77-page revised guide to combining sound design principles, proper selection of steels and good treatment to achieve optimum economy and material performance, contains separate

sections on design, steels and treatment, amply illustrated with tables and charts. The steel section deals mainly with heat treated alloy steels used at tensile strengths below 200,000 psi, and does not include steels such as the high-strength low-alloy structural, stainless or tool steels. Climax Molybdenum Co., 1270 Avenue of the Americas, New York 20, New York.

Use postpaid card. Circle No. 144

DRAFTING AIDS

Printed circuit drafting aids chart contains a six page illustrated table which includes all of the pre-cut pressure sensitive shapes and narrow tapes required to make paste-up printed circuit drawings that will conform to military specifications, together with many new non-military configurations. It provides convenient illustrated cross reference between corresponding sizes

of donut type pads, teardrop pads and twin pads. The illustrations are actual size to assist draftsmen in making visual comparisons. By-Bulk Company, 4314 West Pico Blvd., Los Angeles 19, Calif.

Use postpaid card. Circle No. 145

PLASTIC SCREW PLUGS

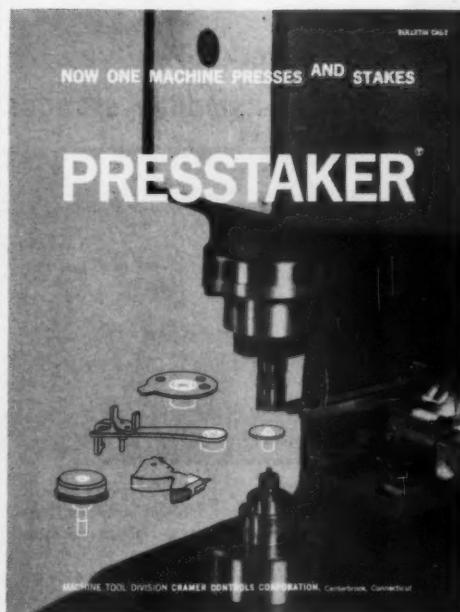
Bulletin describes metal reinforced plastic screw plugs, for use in holding screws in wood, tile, stone, or plaster. Chart lists complete line of sizes available showing which fastener is used with each size. Ace Sycamore, Inc., Fastener Division, Sycamore, Ill.

Use postpaid card. Circle No. 146

ALLOY & FLUX WALL CHART

Welding, brazing and soldering alloys and fluxes are rapidly selected according to the base metal to be joined, when using a ready-reference wall chart. The chart measuring 19½ x 25½ inches, has

**THIS BULLETIN SHOWS YOU
HOW YOU CAN CUT YOUR
ASSEMBLY COSTS DRASTICALLY
... send for it!**



Now pressing and staking are combined in a remarkable new kind of automatic assembly tool — PRESSTAKER. What's more, PRESSTAKER does a better job of pressing or staking independently — saves you money either way.

FAST — up to 1,400 parts per hour.

ACCURATE — uniform stake penetration with staking point shift less than .001.

POWERFUL — assemble components of almost any material with impact greater than a 1-ton hydraulic press — or gentle enough to set a tiny eylet.

FLEXIBLE — with standard interchangeable tooling operator changes jobs in less than a minute.

PRESSTAKER pays for itself in days by (1) cutting labor costs, (2) eliminating subassembly inventories, (3) reducing capital equipment costs, (4) saving space, (5) reducing design limitations and (6) eliminating human error. Send for free bulletin today and learn why.

PRESSTAKER

Machine Tool Division — CRAMER CONTROLS CORPORATION — Centerbrook, Conn.

Use postpaid card. Circle No. 250

complete line of welding, brazing and soldering alloys and fluxes—for joining all commercial metals—indexed under common base metals. Included is a description of an aluminum joining alloy line. Government specifications met by All-State aluminum alloys are given in tabular form. All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N.Y.

Use postpaid card. Circle No. 147

THIN WALL INSERTS

Mechanical properties and methods of determining performance of high strength thin wall inserts are given in information folder. Included also are engineering drawings and specifications and installation procedures. Kaynar Manufacturing Co., Kaylock Division, Box 2001 Terminal Annex, Los Angeles 54, California.

Use postpaid card. Circle No. 148

PNEUMATIC ASSEMBLY TOOLS

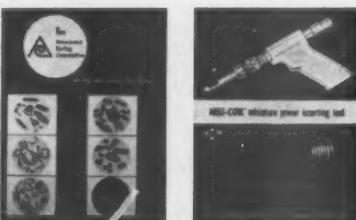
Adjustable stroke midget air-clamp cylinders are some of the pneumatic production tools and units described in 56-page catalog. Included in the catalog are complete diagrams and specifications of single-acting air cylinders, double cushioned air cylinders, and assembly, punching, peening, riveting and crimping units. Mead Specialties Co., 4116 N. Knox, Chicago 41, Ill.

Use postpaid card. Circle No. 149

SPRING DESIGN

A new 16-page manual gives engineers and purchasing executives authoritative information needed to specify custom-designed and standardized precision springs. The new manual summarizes basic information concerning helical and flat springs, wire forms, special fasteners, precision metal stampings and assembled spring-like devices. It also includes design briefs which simplify the specifying of compression, extension, torsion and flat springs. Associated Spring Corp., 18 Main St., Bristol, Conn.

Use postpaid card. Circle No. 150



POWER TOOL FOR INSERTS

How a miniature power inserting tool designed to install a range of small sizes of inserts can reduce production time and costs is described in a four-page bulletin No. 770A. Several photographs, a drawing, and an exploded view highlight details of design and

use. Special sections of the bulletin are devoted to operation and maintenance of the tool. Heli-Coil Corp., Shelter Rock Lane, Danbury, Conn.

Use postpaid card. Circle No. 151

PORTABLE POWER TOOLS

The No. 62, 32-page catalog covers complete line of high frequency tools including grinders, sanders, polishers, impact wrenches, screwdrivers, nut-setters, drills, reamers, and balancers. Forepart of the catalog presents an analysis of high frequency tools with a capsulated report on the advantages of using 180, 360 or 400 cycle tools for specific job applications. Thor Power Tool Co., 175 N. State St., Aurora, Ill.

Use postpaid card. Circle No. 152

ASSEMBLY PRESSES

Solid one-piece crankshafts, one-piece semi-steel frame and precision balanced flywheel are some of the features of a power press described in four-page information folder. Included also are descriptions of arbor presses, air presses, squaring shears and milling machines. Famco Machine Co., 3154 Sheridan Rd., Kenosha, Wis.

Use postpaid card. Circle No. 153

SELF-LOCKING CAPSCREWS

New literature describes the self-locking capscrew, its design and principle of locking. This self-locking capscrew employs the same locking principle as the Klincher Locknut, namely by deflection of the locking collar which clinches both radially and axially. Klincher Kapscrew, Inc., Dept. KKL-766, 2153 Hillside Ave., Indianapolis 18, Indiana.

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AT RAYTHEON:

Stackbin's all-plastic bins provide fast, flexible assembly stations



New, non-corrosive, easily cleaned... stack and restack securely in tight semi-circular arrangement to suit changing requirements... molded card holders on fronts for fast, easy parts identification... sloping bottom for easy parts accessibility.

Custom fitting, plastic insert doubles the number of different components you can handle without increasing space requirement.

FREE FACTS Write for new product bulletin and prices. All Stackbin products sold direct.

STACKBIN CORP. 1155 Main St., Pawtucket, R.I.

Mfgd. and sold in Canada exclusively by Wickware-Stackbin, Ltd., Perth

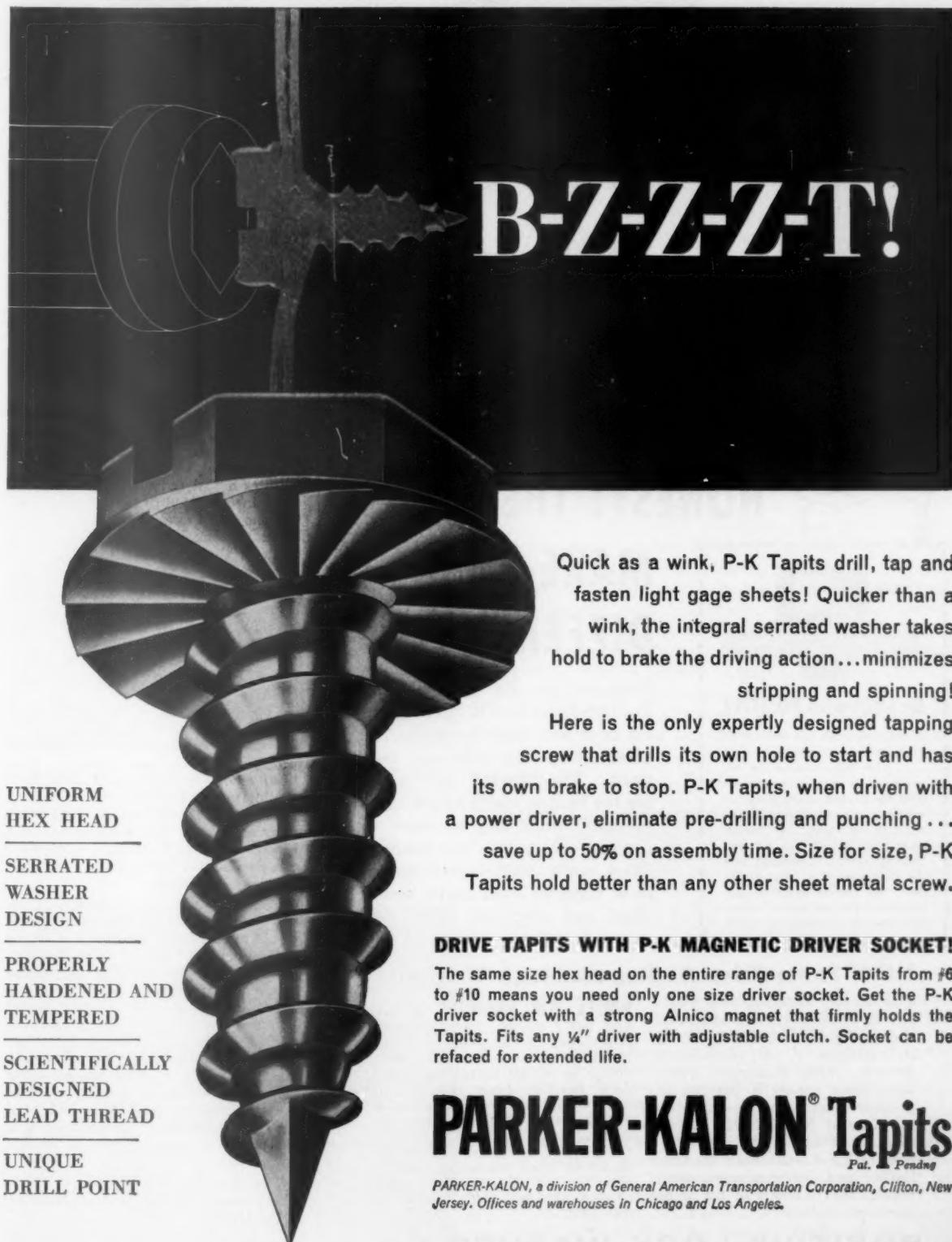


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FASTENERS FOR AIRCRAFT AND MISSILES
Immediate Delivery—Air-M.A.S.M. 100%
CERTIFIED TO GOVERNMENT SPECIFICATIONS
Bolts—Nuts—Rivets—Screws—Studs—Internal and
External Wrenching Tools—Bolts—Screws and Lock Pins

Mercury air parts co., Inc.
9310 West Jefferson Blvd., Culver City, Calif.
Telephone—UPTON 5-5832—Teletype—CVR CT 4338
TOUGH SPECIALS 10 DAY DELIVERY

A *real* self-drilling screw!



B-Z-Z-Z-T!

**UNIFORM
HEX HEAD**

**SERRATED
WASHER
DESIGN**

**PROPERLY
HARDENED AND
TEMPERED**

**SCIENTIFICALLY
DESIGNED
LEAD THREAD**

**UNIQUE
DRILL POINT**

Quick as a wink, P-K Tapits drill, tap and fasten light gage sheets! Quicker than a wink, the integral serrated washer takes hold to brake the driving action...minimizes stripping and spinning!

Here is the only expertly designed tapping screw that drills its own hole to start and has its own brake to stop. P-K Tapits, when driven with a power driver, eliminate pre-drilling and punching... save up to 50% on assembly time. Size for size, P-K Tapits hold better than any other sheet metal screw.

DRIVE TAPITS WITH P-K MAGNETIC DRIVER SOCKET!

The same size hex head on the entire range of P-K Tapits from #6 to #10 means you need only one size driver socket. Get the P-K driver socket with a strong Alnico magnet that firmly holds the Tapits. Fits any $\frac{1}{4}$ " driver with adjustable clutch. Socket can be refaced for extended life.

PARKER-KALON® Tapits

Pat. Pending

PARKER-KALON, a division of General American Transportation Corporation, Clifton, New Jersey. Offices and warehouses in Chicago and Los Angeles.

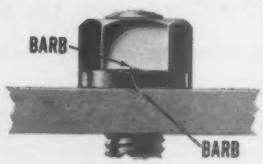
TEST P-K TAPITS FOR YOURSELF! ASK YOUR DISTRIBUTOR FOR A DEMONSTRATION!

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Billy Barb says,

"HONEST! THE BARBS



Be SURE with POSITIVE

Illustration shows how NON-LINK Positive Lock Washers work . . . how they combine the advantages of tooth-type washers with the proved spring-power of regular lock washers. Arrows point to the "teeth" or "barbs" embedded in both the nut and bearing surface. Combined with the spring-power of the washer itself, this feature provides double assurance that bolted assemblies remain permanently tight.

MAKE THE DIFFERENCE!"

You can see for yourself why Positive NON-LINK Lock Washers have long been known as one sure way to keep bolts and nuts tight. The "barbs" or "teeth" are the feature which makes them different from and superior to conventional spring lock washers. They really hold bolted assemblies together even under severe shock and vibration.

NOW Same Price As Regular Lock Washers!

You can buy these superior NON-LINK Positive Lock Washers at the same price as ordinary spring lock washers. A new mechanized process which eliminates costly hand labor makes it possible to produce them in the 9 most popular sizes at NO EXTRA COST to you. What's more, they conform to A.S.A. standards, are non-linking and interchangeable with regular lock washers of the same size and section.

WRITE FOR SAMPLE! If you will write us on your company letterhead, or use your company Purchase Order, we will send you a generous sample of Non-Link Positive Lock Washers in any or all of the following 9 popular sizes (Medium Section): 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 3/4". Just tell us which sizes you want, and the samples will be on their way, at our expense. NO CHARGE TO YOU.

POSITIVE LOCK WASHER CO.

187 Vanderpool St. • Newark 5, N. J.

Manufacturers of High Grade Lock Washers Since 1890

Use postpaid card. Circle No. 258

Book Review

COST REDUCTION GUIDE FOR MFG. MANAGEMENT

Cost reduction is a continuing company-wide management function. No one knows better than the harried industrialist how rapidly the world in which he does business is changing. Capacities in most industries exceed by wide margins the product demands. This coupled with increased foreign competition, places an almost impossible burden on those plants which are not cost-competitive.

Many managements have learned too late, and to their great regret, the consequences of waste and high costs.

In a guide book, compiled and written by Wyatt and Morse, cost reduction consultants, management personnel have a complete guide to ways and means of reducing costs in their own company.

More than a general guide to cost reduction, users of the guide will find that many of the time consuming methods and research into what constitutes a cost reduction program have been incorporated in the company profile sheets. In many instances, management personnel can use, right out of context, the profile, to establish their own company's program.

The book is divided into three sections. The first deals with a general introduction to just what cost reduction is. Ways of establishing an effective cost reduction program are presented, showing how the company can use present personnel.

The second part of the book gives typical case histories of companies, and how they went about solving their cost problems. These case histories have been especially selected, to show how the interaction between various departments affected the total cost of company operations. The histories are of a broad nature and company executives can find similar problems in their own company operations.

Many times, the most difficult problem presented to personnel given the duties of cost reduction is one of where to start. In the third section of the book, is a complete guide to the preparation of a company profile. Significant questions are asked which apply to all manufacturing, marketing and administrative operations. With modification, the profile can meet any specific problem that might arise in an individual company. Instruction on how to interpret the profile, as well as exhibits of how other companies had reduced costs through the company profile system are given.

The Cost Reduction Guide is available through Hitchcock's Book Division, price \$18.00.

Answer to problem on page 50
The hour and minute hand coincide 11 times in 12 "hours". Your watch gains 5/11 minutes every 65 or 1 hour every 143.

INDUSTRY MAKES NEWS

MECHANIZATION AT NEW PLANT TO SLASH OLYMPIC TV ASSEMBLY COSTS



Cartons take to the air while radio-television-phonograph units are assembled below. Automatic traffic system insures that carton and assembled unit arrive at end of line simultaneously.



Continuous feeder line dips to allow easy removal of picture tube at assembly station at new Olympic plant.

The Siegler Corporation's Olympic Radio & Television Division has just opened a new 200,000 sq ft final assembly plant in Glendale, Long Island. Employing about 800 people, the new plant will supplement the division's 300,000 sq ft chassis assembly facility in Long Island City.

Heavily mechanized throughout, the plant will be used for the final assembly of the Olympic line of radio, television, and stereo high fidelity phonograph products.

According to Morris Sabin, Olympic president, electronically controlled production lines and special material handling systems will result in savings of approximately 30% in final assembly costs. He listed other benefits as longer and more uniform production runs and higher individual productivity.

Completely self contained, the new plant has its own 14-car railroad siding and inside automatic loading docks capable of handling 14 trucks or trailers at one time.

FEBRUARY FASTENER SHIPMENTS

The seasonally adjusted index of fastener shipments for February, 1961 was 74% of the 1956-58 average of 100%.

The figure represents a drop of 1% from January and is the lowest in over two years. The index reflects the continued depressed activity in the automotive industry and the adverse effect of a severe winter on the construction industry. Both are major users of fasteners.

FASTENER IMPORTS & EXPORTS

According to the year end report issued by the American Iron and Steel Institute, the United States imported 48,342 net tons of fasteners, and exported 13,330 net tons.

The monthly report for January, 1961, shows the same percentage ratio of imports of foreign made fasteners to United States exports, although the volume declined considerably from January, 1960.

CLECO WARRANTS PNEUMATIC TOOLS A YEAR

A one-year warranty of a special group of pneumatic screwdrivers and nutrunners, is now being offered by Cleco Air Tools, Houston.

Tools which feature the new guarantee will be designated Golden Circle air tools and carry that symbol on their label.

The warranty assures the tool buyer that each tool is guaranteed for one year from date of purchase against any malfunction resulting from faulty workmanship, defective parts or failure to perform under normal conditions.

COLD IMPACT EXTRUSIONS



JACOBSON NUT MFG. CORP.

Kenilworth, New Jersey



Available in Stainless Steel, Brass, Aluminum and Steel
JACOBSON NUT MFG. CORP.
KENILWORTH, N.J.

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AVDEL APPOINTS CHIEF ENGINEER

Robert M. McClintock has joined Avdel, Inc. as chief engineer. He was formerly western engineering manager for Camlock Corp. Prior to Camlock, McClintock was chief engineer of Hartwell Corporation for nine years and before that ten years at Boeing as an aeronautical engineer.

THOR NAMES WORKS MANAGER

William C. Adamson has been named works manager of Thor Power Tool Co.'s main plant in Aurora, Ill.

A veteran management official in mass production industries, he will co-ordinate Thor manufacturing facilities.

Prior to joining Thor, Adamson worked with the director of manufacturing at Cummins Engine Co., Columbus, Ind.

BOWMAN ACQUIRES PYRAMID NUT & BOLT

The Bowman Products Co. announced the acquisition of Pyramid Nut & Bolt Corp. Newark, N.J. The latter company is in the special fastener field, catering to the needs of industrial and electronic accounts in the Metropolitan New York-Northern New Jersey area. It will be operated as a wholly owned subsidiary of Bowman under the direct guidance of the present Pyramid management.

No details were disclosed concerning the figures involved in the transaction.



Rocket expert, Dr. Wernher Von Braun, examines miniature water heater which will be installed in space kitchen now being constructed by Whirlpool Corp. Howard Brehm, Whirlpool's space kitchen coordinator, explains function of unit, which is part of kitchen. The completed kitchen is designed to store and dispense all foods and beverages required by three astronauts on a 14-day mission.

Don't drop that screw

Hold it with an
H. J. J. Screw-holding Driver

Like having a third hand, when it comes to holding a screw where you want it! Sizes to handle from #0 to # $\frac{1}{4}$ " screws.

Send for literature, form AFE-5

The H. J. J. Company

268 Marlow Drive Oakland 5, California



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Assembly & Fastener Engineering



For its outstanding achievement in accident prevention, seven years without a lost-time accident, the Hampton, Iowa plant of the Maytag Co. has been cited by Travelers Insurance Co., underwriters of the company's workmen's insurance. Present at award of the plaque given in February were E. G. Higdon, executive vice president of Maytag, William Pink of the Hampton plant; Larry Copeland and Eugene Strutzel of Travelers Insurance.

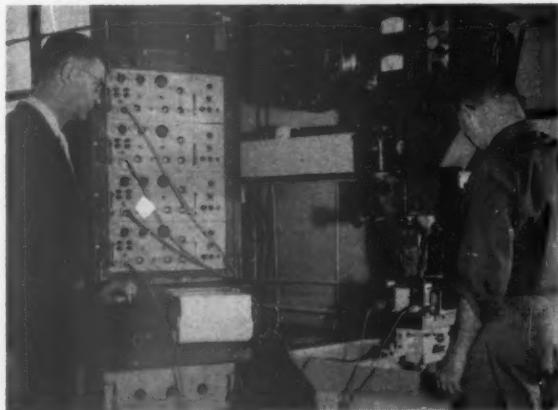
CHICAGO RIVET COFOUNDER PASSES AWAY

Herman J. Tonn, vice president and cofounder of the Chicago Rivet & Machine Co., Bellwood, Ill., died March 17th in the Memorial Hospital, Elmhurst, Ill. His death occurred on the 41st anniversary of the founding of the company.

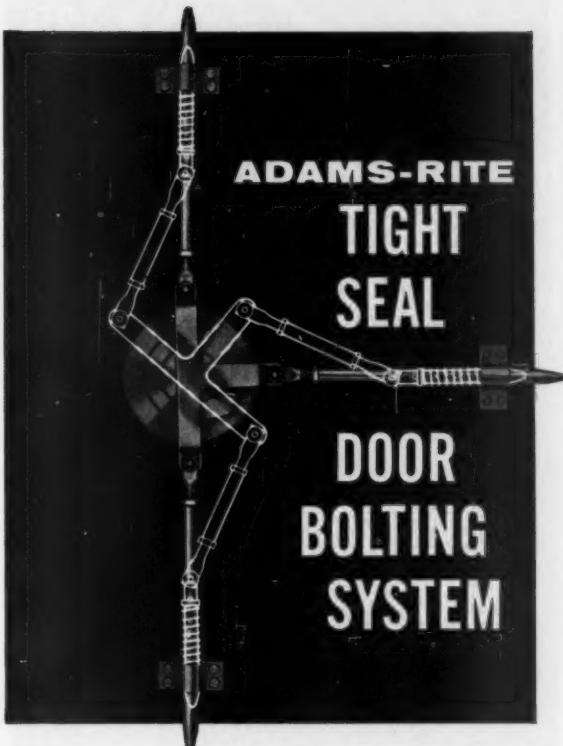
REPUBLIC STARTS WELD NUT PRODUCTION

Republic Steel Corp., has begun production of special Midland weld nuts for blind applications in bolting sheet metal products where vibration would shake ordinary nuts loose or where thin gages are required.

Originated and marketed by the Midland-Ross Corp., the weld nut has been widely used for years. Republic has acquired all manufacturing and marketing rights to the special fastener, and will market it as the Republic Midland weld nut.



Professor Bert H. Norem (l) chairman of the Syracuse U. Dept. of Industrial Engineering, checks the amplifier and record being used by assistant E. F. Skowron (r), to measure the residual stresses in weldment for a joint ASTME Research Fund-Welding Research Council project being conducted at the university's industrial engineering laboratories.



FOR POSITIVE CLOSURE

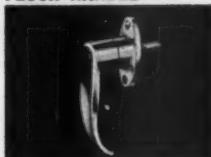
ADAMS RITE multiple-bolt systems are designed for use on doors and panels which must be secured at more than one point. They are of particular value on doors or hatches which must be closed with POSITIVE seal to prevent the entrance or escape of moisture, air or gas. Environmental chambers, electronic equipment, pressurized testing units, and paint spray booths are a few of the applications where these A-R systems have proven themselves.

ADAMS RITE has been manufacturing precision mechanical products for over 50 years and is the major supplier of door hardware for the aircraft industry. A-R products are designed for a purpose and include locks, latches, handles, door bolting systems, tie-down fittings, and mechanical controls. Products for specialized applications are designed and manufactured to customer specifications.

AVAILABLE WITH:



FLUSH HANDLE



LOCKING HANDLE



NON-LOCKING HANDLE

Write for complete information or latest file catalog of descriptive literature. Dept. B-2



"Over half a century"

ADAMS RITE
MANUFACTURING COMPANY

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Glendale 4, California

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IMPORTANT NEWS FOR SILVER BRAZING PREFORM USERS

NEW "CLOSE CLUSTER" DIE PROCESS CUTS BRAZING PREFORM WASTE, SAVES YOU MONEY!

Scrap means waste. And that adds to the cost of your silver brazing preforms. Precision dies arranged in a "close cluster" make maximum use of every inch of silver brazing or precious metal strip. This cuts waste, saves you money. Developed originally by Alloys Unlimited for the semiconductor industry, this new technique of "close cluster" stamping makes other methods old fashioned. Start saving . . . Send us your specifications, then compare our bids with your present costs. No obligation, of course.

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Gears & Pinions



GEAR & PINION GUIDE BOOK
Gives full specs for hundreds of combinations of small zinc die cast zinc alloy gears integral with pinions, shafts, spacers, etc., and variations to specs.

GRC's unique high speed, automated methods give you high quality, uniformly accurate small parts in die cast zinc alloy or molded Delrin, Nylon and other engineering thermo-plastics . . . at low cost. GRC experience and exclusive techniques open the way to new design freedom, new production and assembly shortcuts. Write, wire, phone NOW for samples and detailed bulletins. Send prints for prompt quotation.

NO MINIMUM SIZE! Maximum size:
Zinc Alloy—2" long, $\frac{1}{2}$ " wide. Plastic—1 $\frac{1}{4}$ " long, .08 oz.

GRIES

GRIES REPRODUCER CORP.

World's Foremost Producers of Small Die Castings
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See us at DESIGN SHOW—#1143; PLASTIC SHOW—#1549

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BASTIAN HEADS NEW HELI-COIL DIVISION

Heli-Coil Corp. has appointed William Bastian to head its new marketing division.

The marketing division was formed to provide marketing services and achieve economies in operation for the corporation and its recent acquisitions, the Grip Nut Co., So. Whitley, Ind., and the Phelps Manufacturing Division, Danbury.

The newly appointed head of the marketing division joined Heli-Coil in 1956. He served as director of the systems and planning division and later became assistant to the president. Prior to joining Heli-Coil, Bastian was senior engineer at Haller, Raymond & Brown, State College, Pa.



RES. ENGR., SALES REPS, FOR ROTOR TOOL



WHITEHOUSE



HOWEY



JONES

Thomas L. Whitehouse, former machine design instructor at the Fenn Technical Institute, has joined the engineering staff of Rotor Tool as field engineer, doing product research.

John S. Howey and Edgar E. Jones have joined the company as direct factory representatives in the Pittsburgh area. Howey has had wide experience in industrial management

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with the **BEAD CHAIN**
ECONOMICAL
MULTI-SWAGE
METHOD

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LOWER PRODUCTION COSTS on Tiny Metal Tubular Parts

Bead Chain's exclusive multi-swage method automatically swages almost any type of tiny metal tubular part from flat stock into precision forms with positive, tight seams. High-volume production can be delivered speedily and at far less cost than with conventional methods of manufacture. Parts can be beaded, grooved, shouldered and made of almost any metal. Diameters up to $\frac{1}{4}$ ", lengths to 1 $\frac{1}{2}$ ".



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**THE BEAD CHAIN
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Assembly & Fastener Engineering

and engineering fields and has held a number of executive positions in the field of precision tools for industry.

Jones, a graduate of the University of Pittsburgh has had wide sales experience in industrial equipment. He was formerly a professional football player, and is assistant coach of the Pittsburgh Steelers football team.

PLANT MANAGER FOR DENISON



William F. Bohannan has been named manager of the Denison Marysville, Ohio plant. In his new position he will be responsible for all operations of the new Denison plant to be erected at Marysville, Ohio. This new facility will be engaged in the production of hydraulic axial piston pumps and valves. Full scale production is expected to be reached the latter part of 1961.

Bohannan's affiliation with the Denison organization began in 1951 when he joined the company as an assistant to the general manager. Later he was appointed supervisor of the Denison research laboratory. Subsequent assignments for Bohannan included supervisory positions in the engineering phase of the Denison organization.

SCREW & BOLT EXPANDS DISTRIBUTOR ORG.

Screw and Bolt Corporation of America announced plans to increase its distributor organization and to broaden its sales efforts in industrial fastener applications.

These plans were announced by the company's new executive vice president in charge of sales, Irving J. Berkman, following a week-long series of meetings of the company's sales, production, engineering and research personnel.

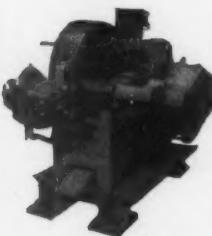
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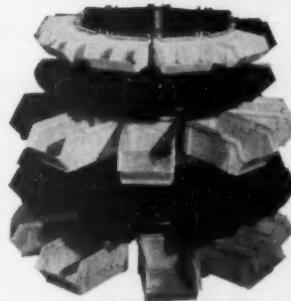
May, 1961

PLASTIBOX ASSEMBLY CONTAINER

ACCESSORIES

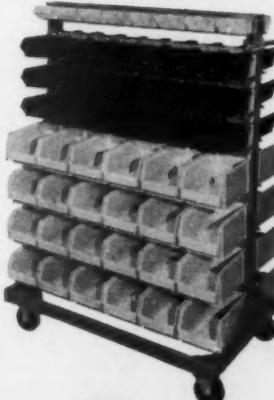


ROTARY BENCH STAND



The Rotary Bench Stand keeps parts and fittings at the worker's fingertips at all times. Easy turning action, but stays where it's placed for fast, efficient work. Mounts various combinations of three Plastibox sizes, or all one size. Boxes can be quickly and easily removed for refilling. A low cost accessory that will pay for itself in a few months!

PLASTIBOX MOBILE TRUCKS



Inexpensive Mobile Trucks are available to handle all Plastibox sizes . . . the truck shown will store and transport over 300 of one size! Trucks have two swivel and two rigid casters and are finished in grey enamel. Boxes can be quickly and easily removed for refilling or for bench work.

Write today for
brochures showing
complete details,
other accessories,
and prices.

G.B. Lewis COMPANY

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SAVE on PARTS MOLDED of

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STOCK PARTS . . . Make your selection from hundreds of different gears, rollers, bushings, glides, etc. Your "special" part may be in our stock — adaptable to your needs. Investigate and save money.

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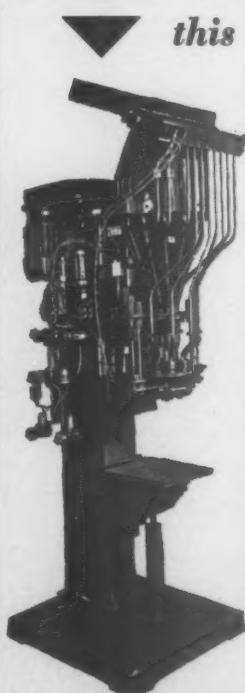
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*this machine will
drive up to
10 screws at
one time . . .*

... reducing assembly costs and improving quality. Built for high production jobs where a fixed set up is practical, this multiple spindle screw driving machine automatically feeds screws from a hopper and drives them to a predetermined torque. Evenly distributed pressure eliminates stresses caused by driving home one screw at a time. A simple sliding fixture positions work pieces accurately.

Machine illustrated shows application of multiple spindle screwdriving to assembly of electric power drills.

Send a sample of your assembly and a list of your requirements. We will be happy to show you how multiple spindle screw driving can be applied to your job.

COOK & CHICK COMPANY
2415 West 24th Street Chicago 8, Illinois

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PROMOTIONS AT CHICAGO SCREW CO.



SMITH



MACKIE



KURE

Edward A. Smith has been named chief product engineer at the Chicago Screw Co., Division of Standard Screw Co. In this position, he will be in complete charge of the company's production engineering and estimating departments. Smith has been with the company since 1933.

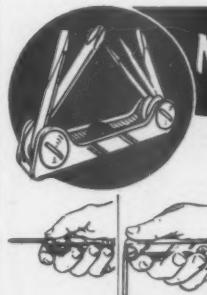
Charles G. Mackie has been named chief engineer in charge of new products development, a new position in the company. He will devote full time to the research and developmental engineering necessary for evolving new products. Mackie has been with the company since 1947, and has service as director of engineering for the past six years.

Raymond M. Kure has been promoted to plant controller. He will be responsible for the company's general and cost accounting. Kure joined the company in 1937.

SMITH BOLT CO. OPENS LOUISIANA PLANT

In a move to provide faster, more complete service for the Gulf Coast areas, the N. J. Smith Bolt Co. has opened a new plant at 4928 Jefferson Highway in New Orleans.

The plant will service primarily as a holding point for the



New! A JACKNIFE 5-IN-1 SCREWDRIVER SET

NEW combination tool with 5 screwdriver blades in one complete unit. All blades made from high quality steel, hardened and tempered. Each blade can be used straight out or at right angles for extra leverage.

Each unit contains: 3/16" Flat Blade
#2 Phillips Type 3/8" Flat Blade
1/4" Flat Blade 3/16" Hole Punch (Awl)



Also... A POCKET KNIFE 7-IN-1 HEX KEY SET

At last a hex key set with 7 blades that will fit all types of hex socket screws. Use it . . . fold it up and put in your pocket . . . just that simple.

Use straight out or at right angles for extra leverage. Made from nickel alloy steel, hardened and tempered for long life.

Send for TRIAL ORDER Now!

5-in-1 JACKNIFE SCREWDRIVER SET	1.49
3 MODELS OF HEX KEY SETS	
7-in-1 General Purpose (Fits #5 to 7/16" set screws)	1.49
6-in-1 Heavy Duty (Fits 1/4" to 5/8" set screws)	2.95
5-in-1 Heavy Duty (Fits 3/8" to 3/4" set screws)	2.95



EKLIN TOOL & MFG. CO.

2627-D N. Western Ave., Chicago 47, Illinois

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Assembly & Fastener Engineering

firm's complete line of industrial nuts, bolts and screw products. Initial manufacture of the plant will center around threaded fasteners used in the construction industry.

A. C. Peebles, former manager of the firm's Beaumont plant will serve as manager of the New Orleans facility.

CAMLOC MOVES WESTERN DIV. OFFICE

Camloc Fastener Corporation, manufacturers of quick-operating fastening devices announced the movement of their western division offices from 5410 Wilshire Blvd., Los Angeles 36, Calif., to more spacious quarters at 5455 Wilshire Blvd., Los Angeles 36, Calif.

MACCO NAMES CUSTOMER SERVICE MANAGER



George P. Reichel has been named manager of the customer service department of Macco Products Co. In his new position, Reichel will co-ordinate the work of the company's research and development laboratories, and relate them to improved customer service.

Macco manufactures cleaners, cutting and extruding lubricants, drawing and forging compounds and other chemicals for the metalworking industry.

STANLEY ELECTRIC TOOLS CHANGES NAME

Effective March 1, Stanley Electric Tools, division of The Stanley Works, changed its name to Stanley Power Tools.

Since the division was set up in the late 1920's with the original manufacture of drills, screwdrivers and grinders,

SHELTON RIVETS

QUALITY • SERVICE • ECONOMY



TUBULAR



SPLIT



INTERNAL
THREADED

Famous
Since
1836

Shelton has effectively demonstrated its techniques and practical solutions to creative problems in rivets of all types. A sense of personal responsibility and quality control is the prime asset of this company. It is our desire to serve, secure and retain customers, whether they use 25,000 or 25,000,000 rivets, through an attitude of helpful service. We will consider it a privilege to be invited to discuss your needs.

THE SHELTON TUBULAR RIVET CO., Shelton, Conn.

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May, 1961



GRIPCO TOPLOCK NUT
One piece all metal

GRIPCO CLINCH NUT

With or without self-locking threads. Hex collar prevents turning when torqueing bolt.



GRIPCO PILOT-PROJECTION
WELD NUT

With or without self-locking threads. Centering collar positions nut and protects threads from weld spatter.

You get these
"extras" when
you specify

GRIPCO®

FASTENERS—

Service — 40 sales representatives all over the country for prompt, fast service.

Reliability — Quality controlled by the oldest established lock nut manufacturer in the U.S.

Stock — Large inventories to ensure out of stock delivery on all catalogued items.

Speed production and lower costs on your products with this GRIP NUT family of GRIPCO FASTENERS. Qualified fastener engineers are available for consultation on all your assembly problems. Consult the yellow pages in your phone book under "GRIPCO" for the one nearest you.



GRIPCO CENTERLOCK NUT
Locking feature in the center for fast feeding
Can be applied from either end.



GRIPCO COUNTERSUNK
WELD NUT
With or without self-locking threads. Counter sink protects threads from weld spatter.

Other Gripco Products:

- Brass Toplock or Centerlock nuts.
- Miniature weld and clinch nuts, with or without lock.
- Toplock and Centerlock Hi Nuts.
- Standard Semi-finish full and jam nuts.
- Stainless Steel lock, weld and semi-finish nuts.
- Cold formed special nuts or parts to print.

Send for samples and NEW CATALOG today

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Subsidiary of Heli-Coil Corporation,
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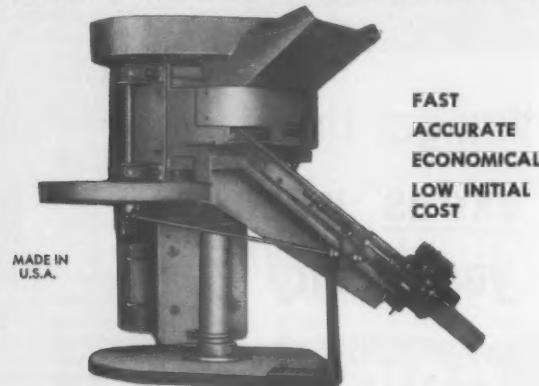
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AUTOMATIC FEEDER and COUNTER



**FAST
ACCURATE
ECONOMICAL
LOW INITIAL
COST**

Here is a low cost piece of equipment designed and built to meet the need of controlled discharge of screws, nuts or washers from hopper to package. Regulates number of parts into chute—prevents clogging—count adjustable and controlled.

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NATIONAL DISTRIBUTORS

MICHIGAN MACHINERY SALES CO.

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thin materials, SPIROL PINS are used in a wider variety of materials: To provide spring pins that will not damage, distort or rupture holes even in soft, brittle or shock and vibration resistance. Therefore, MEDIUM and LIGHT DUTY PINS apply where other flexible pins cannot be used.

Where corrosion resistance is needed, SPIROL PINS are the only spring pins stocked in NICKEL STAINLESS STEEL (302). Two sizes are used in the water faucet shown above. Automatic Assembly: SPIROL PINS cannot interlock

and jam hoppers. Uniform chamfer on both ends speeds inserting pins into holes.

Most complete range of standard diameters:

MINIATURE SPIROL PINS (.032", .039", .044", .052") thru $\frac{1}{4}$ ".



Write for free TECHNICAL DATA MANUAL. Free samples for specific applications.

C. E. M. COMPANY, INC.

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it has grown and expanded into lines of electric planes, routers, saws, sanders, hammers and metal-cutting shears.

Both its products and the types of power used to operate them have become highly diversified. Today the division manufactures electric, high-frequency and most recently, air powered portable tools.

XCELITE EXEC. ON SERVICE TOOLS COMMITTEE

Arch Warden, president of Xcelite, Inc., has become a member of the executive committee of Service Tools Institute, as a result of elections recently held in New York.

He will serve a two-year term for the STI, a national trade association of hand tool manufacturers.

TOWNSEND APPOINTS THREE



KORNMAN



BARRY



WILSON

H. C. Kornman, former assistant general manager of the engineered fasteners division of Townsend Co., was named vice president and general manager of that division. He succeeds R. E. Casner who recently resigned.

Associated with Townsend since 1946, he joined the firm as an industrial engineer and served in various supervisory and executive positions for several Townsend divisions.

P. F. Barry, recently appointed assistant sales manager, assumes the duties of sales manager. He has been with

Why is SPIROL PIN
the true spring
a more versatile fastener?

The Only Blind Fastener Which Grips Any Material From 0" To $\frac{3}{8}$ " Thick

EASY TO INSTALL

- 1 Insert Jack Nut into hole. Needs only $\frac{1}{4}$ " expansion space.
- 2 Run in screw to collapse spider anchor backing by exerting pull on thread.
- 3 Jack Nut now is installed and ready to receive attachment screw.

JACK NUT

The Jack Nut cuts cost, speeds assembly, solves hitherto impossible fastening problems. Can be used as a rivet and/or blind fastener. It's versatile, easy to use and no special tools are needed.

The only blind fastener with threads which grips any material from 0" to $\frac{3}{8}$ " thick. Needs only $\frac{1}{4}$ " expansion space. Allows holes to be fashioned before, during or after fabrication. Hole size is not critical and special type of hole is not necessary.

Made of quality steel, cadmium-plated. Grips evenly on rough as well as smooth surfaces. Provides vibration-proof assembly. Weight-carrying capacity is limited in most cases only by strength of the material in which used.

Sold By Wholesale Hardware, Electrical Wholesale & Industrial Supply Distributors

MOLEY CORP.
2308 N. 5th St., Reading, Pa.

SPECIFICATIONS

CAT. NO.	A	B	C	D	E	F
	CAP. DIAM.	CAP. THICK.	BODY DIAM.	O'ALL L'DTH.	THREAD SPREAD	MAX. CAP.
43. JN	15/32	3/64	9/32	9/16	6-32	43/64
44. JN	15/32	3/64	9/32	3/4	6-32	43/64
* 45. JN	17/32	1/16	3/8	11/16	10-24	25/32
** 46. JN	5/8	1/16	27/64	3/4	1/4"-20	13/16

S for 0" to $\frac{3}{8}$ ", L for $\frac{3}{8}$ " to $\frac{1}{2}$ "
* 8-32 & 10-32 threads available
** 10-34 & 12-34 threads available
NOTE: 45, JN & 46, JN also available in brass

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Assembly & Fastener Engineering

Townsend for seven years and has served as eastern district sales manager.

Malcolm Wilson, former plant engineer at Ellwood City, Pa., has been appointed plant manager there. Before joining Townsend in 1956, Wilson was associated for five years with the Delta Star Electric Div. and Hinderliter Tool Div. of H. K. Porter Co.

TWO APPOINTED AT POLY INDUSTRIES



SINDER



MARTIAL

Jack Sinder has been named vice president and assistant general manager of Poly Industries. Prior to his appointment as a corporate officer, Sinder was assistant to the president of the firm.

Lou Martial was named director of sales. He will direct all sales activities

for the parent corporation, its division and subsidiaries, including the Awica Division, Turbo Products, U.S. Propellers and Polysyn Plastics.

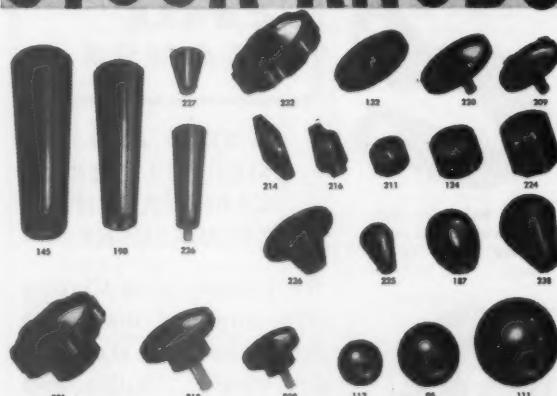
Poly Industries and their division produce a widely diversified line of fastening devices, precision components, and assemblies for the aircraft, missile and rocket industries.

H. M. HARPER OPENS TEXAS WAREHOUSE

Opening its second new warehouse in four months, the H. M. Harper Co. of Morton Grove, Ill., has opened a warehouse in Houston which will carry a complete stock of non-ferrous and stainless steel fasteners.

The warehouse will serve customers throughout Texas, Oklahoma and Louisiana.

STOCK KNOBS ...NO TOOLING CHARGE!



Wide selection molded plastic knobs, handles, hand-wheels at no tooling charge! Minor changes (inserts, threads, color, etc.) to suit requirements. Other modifications give your part a look of exclusive design at fraction of new mold cost! Write for complete illustrated catalog, or see Sweet's Product Design Catalog File.

DIMCO-GRAY COMPANY

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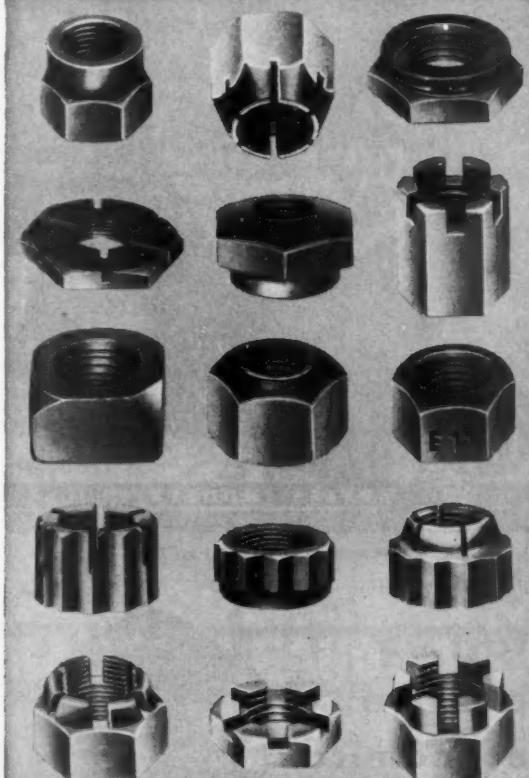
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May, 1961

SPECIAL NUTS

to specs. 3/8" - 4-1/4" cross flats

special machines + large stock of material × years of experience = speedy deliveries high quality low prices



Here are a few samples made to customers specifications . . . Our batteries of special high-speed multi-spindle, automatic machines make possible fast and accurate production of hexagon nuts of non-standard height and special shape from carbon or alloy steel, Naval bronze or other non-ferrous metals; also AN 310 through AN 335 as per latest Airforce specifications. Very often the special nut you require may be similar to one we are already making and a simple modification would result in a price advantage and quicker deliveries to you . . . Send us your blueprint and particulars — let us quote on your requirements . . We also have a catalog that contains complete specifications, engineering data and prices regarding our standard nuts.

Manufacturer of Standard and Special
*12 Pointer, Square and Hexagon Nuts
... "Huglock" and "Conelok" locknuts.

**NATIONAL MACHINE
PRODUCTS COMPANY**

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UTICA, MICH



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85

A complete line of modern, economical, metering, mixing, and dispensing equipment for one and two-part compounds, foams, adhesives



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fast...
positive...
economical

DECKER

Decker Weld-Nuts are manufactured to meet your demands for a better, faster, more positive method of parts assembly. Like all Decker Industrial Fasteners, Weld-Nuts are produced via the cold-head process to assure a uniform quality and exceptional economy. Decker Weld-Nuts are available in three basic types and a broad range of sizes to meet every conceivable need.

Study your production applications now and see for yourself the many operations where Weld-Nuts could save your production time and dollars.

Then... write for sample fasteners, as well as your copy of Decker's new illustrated Industrial Fastener catalog!

WELD NUTS

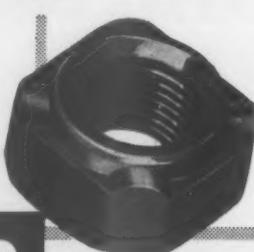
COLD HEAD PROCESS

OTHER DECKER INDUSTRIAL FASTENERS

Pipe Plugs

Clinch Nuts

Hex Nuts



DECKER NUT

1900 N. CLARK ROAD • ALBION, MICHIGAN

Use postpaid card. Circle No. 274

MANUFACTURING
CORPORATION

MAY NAMED EXEC. V.P. OF ALLEN MFG.

G. A. May has been named executive vice president and general manager of the Allen Manufacturing Co., a wholly owned subsidiary of Chicago Pneumatic Tool Co.

As executive vice president, May will be the chief officer of the subsidiary and responsible for all phases of its operation.

May has been with the parent company since 1940, and prior to his appointment he was general manager of the company's Oil Tool Division.



THOR SETS UP ELECTRONIC TOOLING DIV.

Establishment of an Electronics Tooling Division has been announced by R. G. Faverty, vice president, Thor Power Tool Co., Aurora, Ill. The new division will develop products specifically designed for manufacturers of electronic equipment.

Faverty also announced that Thor has become a licensee under Western Electric Company patents to manufacture tools for making solderless wire wrapping connections.

Howard F. Wilson, an engineer with eight years experience in tooling for the electronics and communications industries, will head the new division.

SCIAKY RESEARCH DIV. MOVES TO CHICAGO

Sciaky Bros., Inc., research division located in Los Angeles, Calif., will in the very near future be transferred to the company's recently enlarged plant facility in Chicago, Illinois. The move is being made to centralize and integrate R&D work with the main plant's laboratory and manufacturing activities.

Weckesser

CABLE CLAMPS



A STYLE AND
SIZE FOR EVERY
CABLE FASTENING
REQUIREMENT



of economical Ethyl-
Cellulose for maximum
service at minimum cost.

Weckesser Cable Clamps offer superior insulating properties, high strength, light weight... with no rust or corrosion. Non-circular shapes also available. Immediate delivery from on-hand stocks.

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Assembly & Fastener Engineering

AMERICAN STEEL NAMES KIMMEL ADV. MGR.



KIMMEL

Richard Kimmel has been named advertising manager of American Steel and Wire, a division of U.S. Steel. He succeeds Orton B. Stauffer.

Kimmel joined American Steel and Wire following World War II service with the U.S. Navy. In 1956 he was named administrative assistant to the vice president and general manager of the divisions Cyclone fence department in Waukegan, Ill. In 1959, he was named co-ordinator for Cyclone products in the Cleveland offices of the division. He was serving in that capacity at the time of his new appointment.

BRIAN NAMED MGR. OF GM ASSEMBLY DIV.

Henry T. Brian has been appointed manager of General Motors' Buick-Oldsmobile-Pontiac assembly division plant at Arlington, Texas.

A member of the General Motors organization since 1936, he has been production manager of the BOP plant at Kansas City, since 1957. Brian served as personnel director of BOP plants at Los Angeles and Kansas City prior to his appointment in 1953, as director of personnel for the BOP assembly division in Detroit.

NEW FIRM IN ELECTRON BEAM WELDING BUS.

A new industrial enterprise called Ultra-Motive, and headed by Ilow C. Limb, has leased a 7700 sq ft plant in El Cajon, California. One facet of the firm's business will be technical sub-contracting, including electron beam welding. The welding operations will be under the direction of Elvis Brown, formerly with Brad Thompson Industries.

For Stud Setting and Pulling and TORQUE CONTROL TOOLS

"Titantorker" Controlled Torque Driver



For variety of torque uses. Audible signal when desired torque is reached. Easy adjustment. Four sizes: maximum torques from 75° lb. to 225° lb. Female adapters in driving head; male adaptors on torque base.

Heavy Duty Jaw Controlled (Torque) Drive Stud Driver



New heavy duty jaw brings the ultimate within reach for users of self-opening stud drivers. Predetermined amount of torque can be applied to stud during driving. For use with any air or electric drill or drill press. Sizes No. 101—No. 102—No. 103.

"Bull Dog" Stud Driver



Designed for Use With Impact Wrenches

Built for rugged use on heavy engines. Equipped with Titan Design, Loose Pressure Plunger. Definitely stands up under vibration encountered when using an impact wrench for motive power.

Titan "Roll Grip"



Combination Stud Driver and Puller

Incorporates roll action to grip as little as $\frac{1}{2}$ in. of unthreaded body of stud. Made in standard sizes from $\frac{3}{16}$ to 3 in. inclusive.



World's Largest Producers Of Stud Drivers And Pullers

TITAN TOOL CO.

47 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

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Magna-tip® A Complete Line of MAGNETIC

BIT HOLDERS • FINDERS • SOCKETS



MAGNETIC ACCESSORIES FOR POWER TOOLS

FOR ALL TYPES OF FASTENERS

FINDERS



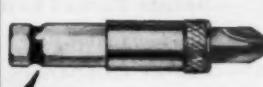
FOR SLOTTED HEAD SCREWS

SOCKETS



FOR HEX HEAD SCREWS

BIT HOLDERS



FOR RECESSED HEAD SCREWS

BOLT CLEARANCE SOCKETS



FOR NUTS



MAGNETIC HAND TOOLS FOR THE MAINTENANCE MAN

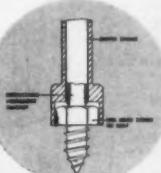
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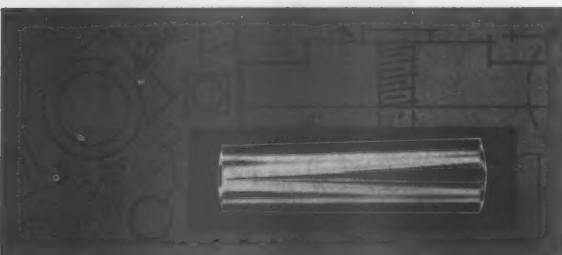
Don't overlook these articles

FEATURES

- 25—Role of Joint Design in Furnace Brazing**
Presenting design principles necessary for optimum results.
- 29—How Fastener Tension Varies with Load**
Second of three articles on fastener preload theory.
- 35—Design Barbed Latch for Mace Missile**
Fastening device based on an age-old principle.
- 37—Use of Component Holders as Fasteners**
Role of clips and holders in assembly and maintenance.
- 40—Preview of Design Engineering Show**
Fastening materials to be displayed in Detroit.
- 47—Preview of the Tool Exposition**
Assembly equipment to be exhibited in New York.

IDEAS AND REPORTS

- 15—Welding under Microscope Aids Design**
Simplifies resistance welding of potentiometer components.
- 15—Plastic Paddle Smooths Soldered Seams**
Ford obtains smoother finish with phenolic laminate paddle.
- 16—Extend Use of Fasteners in Submarines**
Utilize fastener with pre-established torque level.
- 16—Bonding Lining to Optical Pliers**
New adhesive eliminates production bottleneck.
- 18—High Brazing Rate with Manual Unit**
Unit processes two rocker arms in seven rounds.
- 20—Clamp Aids Pre-Assembly of Seal Rings**
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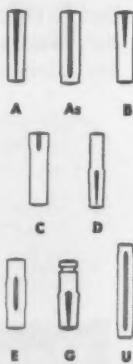
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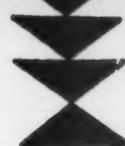
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ONE LAST WORD

TOWARD THE NEW FRONTIER ON TIRED BACKS?



that America's productive equipment is tired and old; it will become increasingly difficult to meet the bills. Unrealistic governmental fiscal policies have militated against expansion and replacement of our productive equipment, where much of our wealth originates.

A weary and worn industry cannot meet the optimistic bills of the new frontier, cannot provide employment, cannot meet foreign competition, cannot reduce prices. From an inefficient industry we can expect only more unemployment, higher prices, and fewer tax dollars. To be sure, some palliatives have been suggested: higher tariffs, labor refusing to work with components made overseas, industry going abroad and importing parts to be assembled here. What monumental nonsense this all is!

We must attack the root of the problem on a broad, three-fold front, composed of government, labor and industry.

If the government is a partner, taking 50% of the profits, is it too much to ask that the partner contribute to the health of the partnership by at least providing a favorable climate in which the partnership can operate? If the partner can subsidize farmers and others and can organize an FHA to stimulate housing, is it too much to suggest a revised depreciation law and a stimulating climate for reinvestment

in equipment? Without asking for subsidies, cannot government set up an agency to underwrite modernization and replacement programs?

If labor thinks its featherbedding and continuing wage increases help industry and provide security for the membership, let it but look at the 6 million unemployed. Unless there's an end to featherbedding and an end to the more-pay-less-work philosophy, the bread lines will get longer each year. Labor must stop acting like a sophomore and join industry as a senior partner in solving mutual problems.

Industry is not blameless either. Its indirect costs have skyrocketed; there's featherbedding and dead wood at the management level. Employee relations have not always been noteworthy. Frequently, modernization and replacement programs have bogged down in a quagmire of indifference and apathy. More and more financial men are active in the running of a business; they don't know that products are not produced on an adding machine. You don't make money by saving it. Management must realize that, whether it likes it or not—and I'm sure you'll agree, none of us likes the thought—this is a battle of survival in domestic and world markets.

Too many fiscal experts in the government and some labor leaders have their heads in the dark sand, where there is no light.

Wm. F. Schleicher

Vice President & Editorial Director

Billions are being tossed into unemployment relief, billions for foreign aid, and further billions for farmers and other segments of the economy; then there's Health, Welfare and Education, and who knows what else will advance and be recognized in the scramble to the new frontier.

What about a new frontier for those who pay for all this?

Frankly, what about industry, on whose broad back the triumphant beneficiaries will be tooted? Let's stop kidding ourselves and realize

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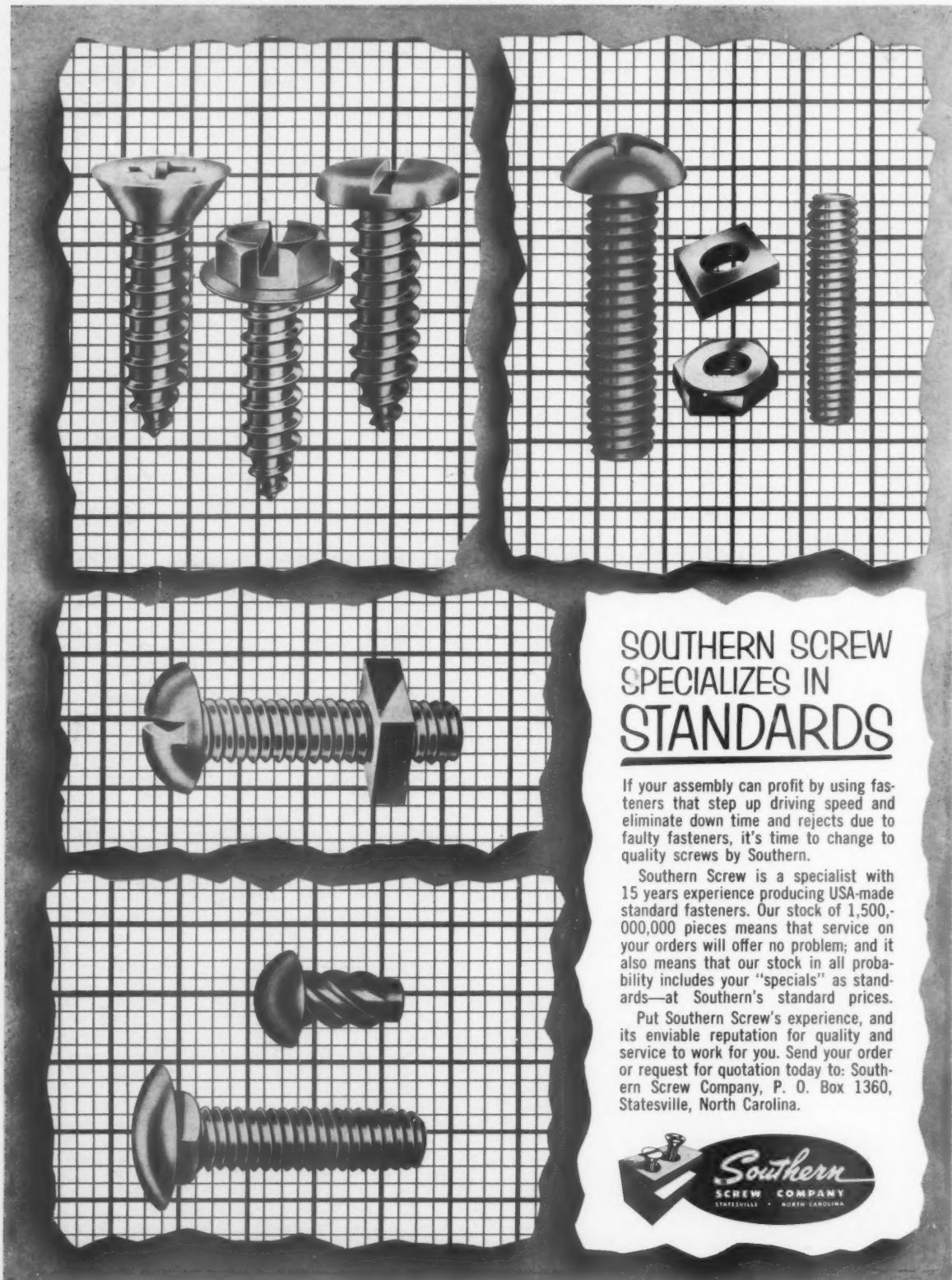
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